BRUHAT BENGALURU MAHANAGARA PALIKE

YELAHANKA DIVISION

NAME OF WORK : Restoration and Improvements of Roads at Hesaraghatta Main road, G Ramaiah layout, Sai Archade layout, Vijaya bank layout, Adityanagara Phase-02, and Surrounding areas in ward no-03 of Yelahanka New town Sub-division

- **Estimation Cost Rs.1150.00 Lakhs**
- **PACKAGE No-09**

Civil Prime Consultants & Engineers

(Project Management Services)

An ISO 9001:2015 Certified Company

(No 23, Shivakrupa CKM Road, Near Akai Public School,
RMV 2nd Stage Sanjay Nagar Bangalore-560094)

CONTENTS

1. Report

2. Project Location

3. Existing Site Photos

4. Detailed Project Estimates

5. Draft Tender Schedule

6. Bill of Quantities

7. Layout Plan

8. Typical Cross Section

9. Ward Maps

Report

Chapter 1 – Introduction

1.1.Background

The well connected road network helps to boost the economy and prosperity of the area. The good roads provide benefit to road users. Bengaluru is the third largest populated city in India with a total population of 13.19 millions it is also called as garden city. There are many gardens and parks. The ancient Bangalore was found in sixteenth century and served as centre of administration for many rules. The city has then witnessed steep growth in population because of the many industries in the field of information technology power construction Real estate health machineries and auto mobiles textile iron and steel and defence etc. Change in various fields and witnessed steep growth in auto mobile industry. It is a growing metropolitan city faces many challenges especially in pollution and logistical areas. The city is situated at an altitude of 900mtr with co-ordinates of 12% 58 N (Lattitude) and 77% 34 E (longitude). The temperature varies from 23 c (winter) and 36c (summer). The average Rainfall of the area is about 850mm per year. The city is well connected with remaining part of the country through Road, Rail network and Air

Bruhat Bengaluru Mahanagara palike has decided to improve the existing road network system, drains, bus bays and footpath facilities for pedestrians in order to cope up with the growing demand of two wheelers, light commer4cial and heavy vehicles.

*1.*2-Objective

The objective of the present project is to prepare a detailed project report covering various studies viz., Topography survey, Subsoil investigations, Traffic surveys, Hydraulic and Total station surveys. The proposed improvement consists Design of Geometric, side drains, junctions, culverts, Strengthening Reconstruction of carriageway along with footpath and road safety measures. The scope of work also includes the quantifying of various items of works and cost estimate

1.3 PROJECT LOCATION

The proposed project includes comprehensive development of road drainage system and pedestrian facilities in Yelahanka area ward No.03, in Yelahanka Assembly constituency. This package consists of 3 works. The total length of these roads is 6.07 kms of flexible and rigid pavements. The project road are located in Northern part of Bengaluru city. It was a Municipal council and Taluk (lies below the District level in administrative setup) headquarters prior to the formation of BBMP (a metro corporation annexing the original Bangalore area and its suburbs) and now forms a part of Greater Bengaluru. A well-planned township was developed during the early 1980s to the north of the city by the Karnataka Housing Board and is identified by several names like 'Yelahanka Upanagara', 'Yelahanka Satellite Town', 'Yelahanka New Town' or simply 'Housing Board'. The population in ward no 03 is 24020 respectively. Restoration and Resurfacing to Cauvery Water Supply and UGD Pipeline Laying Roads at Diffrent Layouts of Attur Ward No.03 (Consisting of 3 Works) Approved Under 110 Villages Development Grant for the Year 2021-22 (Package-9) 1) Restoration and Improvements of Roads at HesaragattaMain Road from Sambram College upto BBMP LIMITS (350.00Lakh) 2) Restoration and Improvements of Balance Roads of G.Ramaiah Layout, Sai Archade Layout, Vijaya Bank Layout and Surrounding Areas in Ward No.03 of Yelahanka Satellite Town Sub-Division (450.00Lakh) 3) Restoration and Improvements of Roads of Adithyanagara Phase-02 and Surrounding areas in Ward No.03 of Yelahanka Satellite Town Sub-Division (350.00Lakh)

1.4 Client

The client is Bruhat Bengaluru Mahanagara Palike, Bengaluru and is the 3 Authority for the implementation of the project.

1.5 Consultant

M/S Civil Prime Consultants and Engineers, Bengaluru has been entrusted with the work of preparation of detailed project report including the cost estimate for the road network in ward No 03.

1.3 PROJECT LOCATION

The proposed project includes comprehensive development of road drainage system and pedestrian facilities in Yelahanka area ward No.03, in Yelahanka Assembly constituency. This package consists of 3 works. The total length of these roads is 6.07 kms of flexible and rigid pavements. The project road are located in Northern part of Bengaluru city. It was a Municipal council and Taluk (lies below the District level in administrative setup) headquarters prior to the formation of BBMP (a metro corporation annexing the original Bangalore area and its suburbs) and now forms a part of Greater Bengaluru. A well-planned township was developed during the early 1980s to the north of the city by the Karnataka Housing Board and is identified by several names like 'Yelahanka Upanagara', 'Yelahanka Satellite Town', 'Yelahanka New Town' or simply 'Housing Board'. The population in ward no 03 is 24020 respectively. Restoration and Resurfacing to Cauvery Water Supply and UGD Pipeline Laying Roads at Diffrent Layouts of Attur Ward No.03 (Consisting of 3 Works) Approved Under 110 Villages Development Grant for the Year 2021-22 (Package-9) 1) Restoration and Improvements of Roads at HesaragattaMain Road from Sambram College upto BBMP LIMITS (350.00Lakh) 2) Restoration and Improvements of Balance Roads of G.Ramaiah Layout, Sai Archade Layout, Vijaya Bank Layout and Surrounding Areas in Ward No.03 of Yelahanka Satellite Town Sub-Division (450.00Lakh) 3) Restoration and Improvements of Roads of Adithyanagara Phase-02 and Surrounding areas in Ward No.03 of Yelahanka Satellite Town Sub-Division (350.00Lakh)

1.4 Client

The client is Bruhat Bengaluru Mahanagara Palike, Bengaluru and is the 3 Authority for the implementation of the project.

1.5 Consultant

M/S Civil Prime Consultants and Engineers, Bengaluru has been entrusted with the work of preparation of detailed project report including the cost estimate for the road network in ward No 03.

1.6 Document Organization

Based on the approach and methodology and form the available date, including the results of surveys and investigation carried out, this report has been compiled and organized as follows.

Chapter 1 - Introduction

Chapter 2 - Scope and Deliverables

Chapter 3 - Methodology

Chapter 4 - Engineering surveys

Chapter 5 - Traffic survey and field investigation

Chapter 6 – Site Investigation

Chapter 7 - Designs Proposal

Chapter 8 – Conclusions and Recommendations

Chapter-2

Scope and Deliverables

2.1 Scope of work

The principal scope of work involved in the project comprises Restoration and Resurfacing to Cauvery Water Supply and UGD Pipeline Laying Roads at Diffrent Layouts of Attur Ward No.03 (Consisting of 3 Works) Approved Under 110 Villages Development Grant for the Year 2021-22 (Package-9) 1) Restoration and Improvements of Roads at HesaragattaMain Road from Sambram College upto BBMP LIMITS (350.00Lakh) 2) Restoration and Improvements of Balance Roads of G.Ramaiah Layout, Sai Archade Layout, Vijaya Bank Layout and Surrounding Areas in Ward No.03 of Yelahanka Satellite Town Sub-Division (450.00Lakh) 3) Restoration and Improvements of Roads of Adithyanagara Phase-02 and Surrounding areas in Ward No.03 of Yelahanka Satellite Town Sub-Division (350.00Lakh)

The improvements works includes construction of New Asphalt Roads and rigid Pavements, Construction of RCC Drains, Culverts and re- modeling of Existing Drains, Footpaths and Culverts.

Scope of work can be broadly classified as follows :-

- Topographical surveys
- Inventory of existing roads

  -- Condition survey of roads

  -- Condition survey of existing Culverts

- Traffic analysis
- BBD Surveys
- Pavements Designs
- Junctions and Culverts
- Road furniture and Appurtenances
- Technical Specification
- BOQ and cost estimates
- Drawings

2.2 Deliverables

The deliverable envisaged during the project implementation are listed below

No.	Documents	Remarks
1	Draft detailed project report	It consists of • The draft report consists of finding Analysis results and recommendation Of the study design covering all the Aspects as per the scope of work.
2	Final Report	• The final report will consist of the Revised draft reports correcting the Suggestions/ recommendation and Comments from the client
3	Drawings	• It will consist of : • Location Map • Plan and Profile • Cross Sections • Structural Drawings • GAD and Structural detailing • Road Furniture • Typical Drawings

Chapter-3

Methodology

3.1. METHODOLOGY

It is very essential to fallow a proper Methodology in order to ensure that all project activities are per scheduled

- Planning and Team mobilization
- Data collection from client and other departments
- Engineering Survey
  - ---Topographical Survey
  - --- Cadastral Survey
- Traffic Survey
- Field Investigations
  - --- Geotechnical Investigations
  - --- Material Investigation
  - --- Road and Structural Inventory
  - --- Sub soil Investigation
- Detailed analysis and study and Recommendations
- Design
  - --- Pavement Design
  - --- Hydrology
  - --- Structural Design
- Preparation of BOQ and Cost estimates
- Preparation of Reports and Drawing templates

Chapter-4

Engineering Survey

4.1 General

The Detailed Topographic Survey forms the backbone for any road improvement project. The basic objective of the topographic survey is to collect necessary available ground features along existing road alignment new alignment in order to consider the type of improvements rehabilitation and to design the new pavements the detailed topography survey has been adopted in analysis design and cost estimates.

4.1 Topographic Survey

The Survey has been carried out using the state of are instruments such as GPS, Total station and Auto levels to achieve accuracy (photographs are enclosed).The visual survey has also been done to collect the details side drains footpaths and drainage structures.

4.3 C B R

The representative soil samples collected and testes are conducted for assessing the CBR values of sub grade. The visual observation reveal some of the roads are located in the interior residential areas where the traffic intensity is very less (considering number if commercial vehicles per day). It is also observed that some of the cross roads having variable carriageway width from 3.00 mts to 12.00 mts surfaced with the cementation layers. The average value CBR is considered as 6.90% for these project roads (Rigid pavement and Flexible Pavement). The CBR values obtained for various roads are enclosed in table-4.1

4.4 Pavement condition survey

The pavements condition survey has been carried out to assess the existing condition of roads with following aspects.

- Study of hydraulics pertains to side drains and culverts in order to assess the capacity to augment the discharge.
- Visual condition of pavement such as potholes and trench line of sanitation pipes.
- Existing concrete is damaged due to site repairs restoration of water supply and Sanitary lines.
- Inventory of road details along with culverts details are given in the tabulation format.
- Details of bus bays and footpaths.

Table 4.1 CBR Results

The necessary tests for representative soil samples collected from site of roads proposed for major improvements have been conducted and finally the CBR values are tabulated as follows:

Sl. No	Name of work	CBR in %
1	Adithyanagar 2nd Main	6.6
2	Doddabettahalli Cross Roads	7.1
3	AMS Layout 4th Cross	6.9
4	Behind Sambram College	6.3
5	Hill Medows Layout (W0736)	6.6
6	Ambabhavani Layout 7th Cross	6.7

The soil samples are so collected from the road sections where the soil strata changes appreciably.

Length statement Annexure 1

Sl .No	Name of work	Length in mtr	Remarks
1	Adithyanagar 2nd Main	150.00	Rigid pavements
2	Doddabettahalli Cross Roads	547.00	Rigid pavements
3	AMS Layout 4th Cross	354.00	Flexible Pavements
4	Behind Sambram College	180.00	Flexible Pavements
5	Hill Medows Layout (W0736)	140.00	Flexible Pavements
6	Ambabhavani Layout 7th Cross	190.00	Flexible Pavements

Chapter 5
Traffic survey and Analysis

Traffic surveys are conducted precisely in order to assess the nature of traffic, type of traffic and its classification. The main factors governing design of the rigid pavements are service life, design in terms of single, tandem, tridem and multi axles and load spectrum tyre pressure displacement of commercial vehicles, directional distribution of commercial vehicles composition and strength of foundation and climatic consideration.

The Road taken up for improvements mainly coming in extenstion areas where carriageway width varies from 3.00 mts to 12.00 mts. The sample traffic survey for one day in order to assess the nature and type of traffic has been conducted at various locations where the location where the local traffic is predominant. Based on these traffic survey details it is observed that the existing traffic consists mainly two wheelers auto rickshaws passenger cars and few light commercial vehicles. In all these internal roads it is noticed that the light commercial vehicles playing on these roads. The traffic intensity of commercial vehicles only is considered for design of rigid pavement as per the norms laid down in Guidelines for design and construction of cement concrete pavements for low volume roads IRC:SP:62-2014 The increase in traffic growth considered as 5% since much growth is not anticipated as these extensions are fully developed. The length of cross roads and main roads are short and terminated with in the Extension Layouts. These traffic volumes are considered as present day volumes with an average growth rate of 5% (interior cross roads in built up areas)and 7.5% (major roads carry heavy traffic) as per IRC 37 -2012.These growth rates are used for projection of traffic for design of rigid pavements where ever required the present traffic in these areas in homogeneous type because of residential areas in respects of flexible pavements those have been proposed in trafficable roads growth rate of 7.5 %is considered in working out the crust composition for formation of new roads. The traffic report is enclosed in Annexure 4.

Chapter 6

Site in Investigations

6.1 Road Inventory

The detailed road inventory survey has carried out for the project roads under consideration.

- Land use
- Name of area
- Existing Bus Stop Details
- ROW details
- Carriageway width
- Type of surfacing
- Width and type of Shoulders
- Road Intersections (s) and their details.
- Height of embankment
- Formation width
- Land width (ROW)
- Culverts, Bridges and other structure (type, size, span, arrangement, and location)
- Utility services on either side of the road and within the ROW.
- General drainage conditions
- Location of flood prone sections

6.2 Cross drainage structures inventory

Inventory and condition survey of the existing cross drainage were carried out to identify their numbers, type condition and hydrological aspects. Only visual inspection and dimensional measurements have been carried out during this survey. This enable to collect the visible As Built information to the extent possible and their conditions to assess individual requirements of the existing structure.

6.2 Cross drainage structures inventory

Inventory and condition survey of the existing cross drainage were carried out to identify their numbers, type , conditions hydrological aspects. Only visual inspection and dimensional measurements have been carried out during this survey. This enable to collect the visible as built information to the extent possible and their condition to assess individual requirements of the existing structure.

The visual observations were carried out during the conditions survey to find out any distress / deficiencies. Providing New RCC Culverts for a varying width of 6.00 mts to 10.00 mts. In addition to the superstructure, masonry, PCC and RCC sub-structure were also examined for any crack, loose joints, spoiling etc.

6.3 Pavement Condition survey

Condition survey is undertaken by visual assessments for the pavements and cross drainage which would cover not only the type but also the magnitude the distress and its location.

Based on the condition evaluation, the causes for various defects observed are examined in detail and decision taken where to initiate a particular maintenance activity, defer the same, or to go in for more detailed investigations to determine the rehabilitation needs precisely where distress on the pavements has reached the stage of the pot-hole etc., affecting smooth operation of traffic which needs rectification immediately.

The objective of the road and pavements condition surveys to identify defects and section with similar characteristics. All defects are systematically referenced, recorded, quantified for the purpose of determining the mode of rehabilitation.

In heavily built up commercial and residential areas, few existing concrete roads are showing distress and also damaged due to the laying of utility lines telecommunication lines and underground drainage system and chambers. These damaged concrete roads are to be removed and replace with the fresh concrete carriage way in order to maintain the existing approach to houses. Commercial establishments and maintain the levels on par with the existing ramps, Culverts for easy movement.

Chapter 7
Design Proposals

7.1 Pavement Design

7.1.1 Introduction

Roads in Bruhat Bengaluru Mahanagara Palike have developed over decades especially in CBD. The pavements constructions is essentially macadam, commensurate with the technology prevailing at that time. Macadam construction involves manually placed stone base bound with stone finales using water spray water bound macadam (WBM), stopped by a poured / sprayed bituminous seal. These are essentially rough roads by today standards. In due course these roads were over laid with bituminous layers and also with concrete.

7.1.2 Pavement Design

The design of rigid pavements is carried out based on IRC SP 62-2014, Guide lines for design and construction of cement concrete pavements for low volume roads and IRC 15-2012- construction of concrete roads.

- The design traffic considered for interior cross roads of residential areas carrying low volume traffic and low intensity.
- Based on sample traffic survy, it is observed that Residential & commercial vehicles per day is 553 nos
- The sub grade CBR value varies from 6.6% to 7.10% for different cross roads within the residential areas.
- The existing roads fall in partial developed residential and commercial established areas where rapid growth in traffic is not anticipated. The moderate growth rate of traffic is considered as 7.5% for interior and major roads as per IRC 37-2012 guide lines.

7.2 Flexible Pavement :-

7.2.1. Flexible Pavement Design

Flexible Pavement is designed keeping in view the anticipated traffic on project road and 2016 as base Year. The base year traffic is considered for projecting the same for a design period of 15 Years. From the volume count, commercial vehicles are considered for the pavement design. The design is based on tentative guidelines for the design of Flexible pavements: IRC 37-2012.

The following equation is used to compute the design traffic in terms of the cumulative numbers of standard axles.

$$N_S = \frac{365 \times (1+r)n-1}{} \times A \times D \times F$$

Where,

NS = Cumulative number of standard axles to be catered in the design

A = Initial Traffic in terms of commercial vehicles per day modified to account for lane Distribution.

R = Annual growth rate of commercial vehicles is 7.50% (Adopted from the analysis).

N = Design life in years (15 years).

F = Vehicles damage factor for the project road the pavement design has been carried Out considering the following factors

- Design the road in an embankment so as have sub grade level above the water level Due to capillary action at adjoining fields
- Good drainage layer for ensuring cross movement of water across the pavement

7.2.2. Input

- **Base Year Traffic on the Project Road**

Initial Traffic in term of commercial per day is considered for the pavement design. No. Of commercial vehicles are derived based on the traffic volume count conducted on the project road sections.

The Traffic Survey date considered is presented in Table 7.1 The Sample Survey was conducted during Sep 2021 and summary of commercial vehicles per day for the project road is presented which is utilized for pavements design.

Table 7.1 Abstract of commercial vehicles traffic including VDF and

No.	Name of road section	No of Residential and Commercial Vehicles	Traffic growth in %
1.	AMS Layout and Adithyanagar	395	7.5

- **Design life**

For the design of pavements, the design life is defined in terms of the cumulative numbers of standards axles that can be carried before strengthening of the pavement is necessary. The design life considered for the projects road is 15 Years.

- **Vehicle Damage Factor**

The Vehicle Damage Factor (VDF) is a multiplier to convert the number of commercial vehicles of different axle loads and axle configuration to the number of standard axle load repetitions. It is defined equivalent number of standard axle per commercial vehicle.

The indicative value of vehicles damage factor as IRC: 37-2012 are indicated in **Table-7.2.** Since the initial traffic volume for the project road is 135 c Residential and commercial vehicles per day the VDF value taken is 3.5 (para 4.4.6). The majority of roads in extension area is single lane to intermediate lane.

Table 7. 3 : Proposed Right Pavement Design

Name of the section	Design parameters		pavement composition, mm				
	CBR%	MSA	DLC	CCP	WMM	GSB	Total
Adithyanagara	6.7	-	150	150	--	--	300

Name of the section	Design parameters		pavement composition, mm				
	CBR%	MSA	DGBM	BC	WMM	GSB	Total
AMS Layout, Ambabavani Layout, Hill Medows Layout SMR Street	6.6	-	50	40	200	150	440

The analysis sheet of Pavement Design is enclosed in Annexure 5 of this report. This case is applicable for resurfacing.

7.2.4. Shoulders

The paved shoulders/ footpath have been designed with 3% cross slope to allow the surface drainage effectively to the side drains. The shoulders are to be paved with Precast slabs of thickness 10.00 cms. It is also proposed to rectify the damaged kerb line.

7.2.5. Side Drains

The existing vent way of side drains have been checked for effective discharge of rainwater to the nearby Culverts.

7.2.6. Cross Drainage Structures

The adequacy of existing vent way size has been checked to accommodate the rain water collected from different directions and discharge the same to the nearby main

7.2.11. Road cross sections

The project road shall be newly constructed / developed to have a single lane to intermediate lane carriageway with paved shoulder of 1.5 mtr or to suitable width on either side is proposed.

Road Features	Specifications
Type of pavements	Rigid and Flexible
Carriageway Configuration	single lane to intermediate lane
ROW(m)- Available	Varying (3.00m to 12.00m)
Central Median (m)	Nil
Main Carriageway(m)	Varying (3.00m to 12.00m)
Paved shoulder (m) Footpath slabs	Varying (0.90 to 1.20m)
Earthen shoulder	Nil
Longitudinal RCC/ Masonry Drain	Nil
Longitudinal Earth Drain	Nil
Utility corridor	Nil
Remarks	Urban &Built up area

7.2.12. Road Furniture

Traffic signs and pavements marking shall include road side signs overhead signs kerb mounted signs cautionary and mandatory signs and road margin along the project roads. The edge line pavements marking in case of asphalt road is proposed as per the IRC Standards.

7.4 Side drains

In order to ensure that there is a proper disposal of run off away from the road influential area, there is a necessity of good drainage network including cross drainage structures at suitable locations. The required cross section along with proper slope to discharge the run off effectively is checked and ensured. The damaged side wall of drain in Size stone Masonry and also in concrete are proposed for repairs and rehabilitation. The damaged cover slabs are also proposed to replace with new Precast / RCC slabs.

7.5 Culverts

The existing vent way of culverts has been verified and ensured to collect and discharge the rain water effectively. The damaged head walls, parapets, coping and deck slabs are proposed for Repairs/ Reconstruction.

Chapter 8

Conclusions and Recommendations

8.1 Conclusions and Recommendations

8.1.1. Flexible Pavement.

Flexible Pavements are constructed from bituminous or unbound material and the stress is transmitted to the sub-grade through the lateral distribution of the applied load with depth.

Flexible pavement is composed of a bituminous material surface course and underlying base and subbase courses. The bituminous material is more often asphalt whose viscous nature allows significant plastic deformation. Most asphalt surfaces are built on a gravel base, although some 'full depth' asphalt surfaces are built directly on the subgrade. Depending on the temperature at which it is applied, asphalt is categorized as hot mix asphalt (HMA), warm mix asphalt, or cold mix asphalt. Flexible Pavement is so named as the pavement surface reflects the total deflection of all subsequent layers due to the traffic load acting upon it. The flexible pavement design is based on the load distributing characteristics of a layered system.

It is proposed to provide overlays as strengthening layers based on Benkelman beam Deflection studies – IRC 81-1981 as follows :-

- Grade sub base (GSB)- proposed 150 mm (firm base)
- Wet Mix Macadam (WMM) proposed 200mm (Sub Base Course)
- Dense Graded Bituminous Macadam Proposed 50mm (Base Course)
- Bituminous Concrete - Proposed 40mm (Surface Course)

8.1.2. Right Pavement

A rigid pavement is constructed from cement concrete or reinforced concrete slabs. Grouted concrete roads are in the category of semi-rigid pavements. The design of rigid pavement is based on providing a structural cement concrete slab of sufficient strength to resists the loads from traffic. The rigid pavement has rigidity and high modulus of elasticity to distribute the load over a relatively wide area of soil.

Chapter 9
Cost Estimates

9.1 Cost Estimates

The cost estimates has been prepared for the work of Restoration and Resurfacing to Cauvery Water Supply and UGD Pipeline Laying Roads at Diffrent Layouts of Attur Ward No.03 (Consisting of 3 Works) Approved Under 110 Villages Development Grant for the Year 2021-22 (Package-9) 1) Restoration and Improvements of Roads at HesaragattaMain Road from Sambram College upto BBMP LIMITS (350.00Lakh) 2) Restoration and Improvements of Balance Roads of G.Ramaiah Layout, Sai Archade Layout, Vijaya Bank Layout and Surrounding Areas in Ward No.03 of Yelahanka Satellite Town Sub-Division (450.00Lakh) 3) Restoration and Improvements of Roads of Adithyanagara Phase-02 and Surrounding areas in Ward No.03 of Yelahanka Satellite Town Sub-Division (350.00Lakh) 10.00Cr Estimates are prepared duly making provision for various items as per the discussions and directions issued in the meeting held in the presence of the Chief Engineer, BBMP, Yelahanka along with concerned Executive Engineer and Assistant Executive Engineer of BBMP.

9.1.1 . Provision

Flexible pavement

Performance of flexible pavements is closely related to the elastic deflection of pavement under the wheel loads. The deformation or elastic deflection under a given load depends upon sub-grade soil type, its moisture content and compaction, the thickness and quality of the pavement courses, drainage conditions, pavement surface temperature etc. Pavement deflection is measured by the Benkelman Beam which consists of a slender beam 3.66 m long pivoted at a distance of 2.44 m from the tip .By suitably placing the probe between the dual wheels of a loaded truck, it is possible to measure the rebound and residual deflections of the pavement structure. While the rebound deflection is the one related to pavement performance, the residual deflection may be due to non- recoverable deflection of the pavement or because of the influence

of the deflection bowl on the front legs of the beam. Rebound deflection is used for overlay design.

It transmits load to the sub-grade through a combination of layers. Flexible pavement distributes load over a relatively smaller area of the sub-grade beneath. The initial installation cost of a flexible pavement is quite low which is why this type of pavement is more commonly seen universally. However, the flexible pavement requires maintenance and routine repairs every few years. In addition flexible pavement deteriorates rapidly; cracks and potholes are likely to appear due to poor drainage and heavy vehicular traffic

Rigid pavement

The rigid pavement has been designed based on traffic data and other results obtained on sub grade soil parameters. The proposed crust consists 150mm thick DLC 150 mm thick pavements quality concrete. It is proposed to rehabilitate the damaged portion of drains, shoulders and culverts.

9.1.2. Cross Drainage Structures:-

The choked and damaged cross drainage structures are proposed for reconstruction.

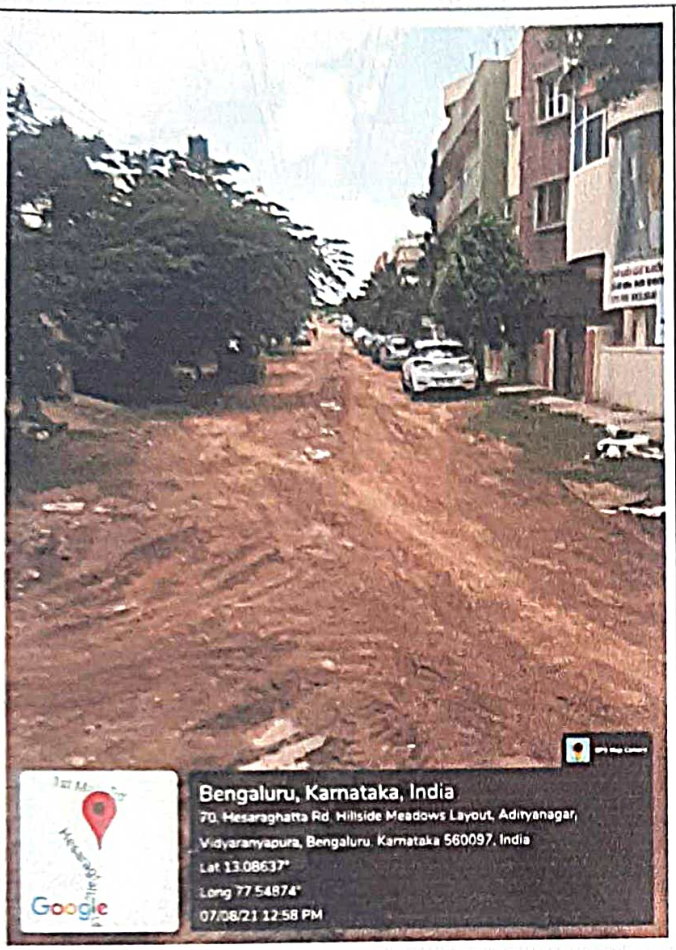
9.1.3. Rate analyses

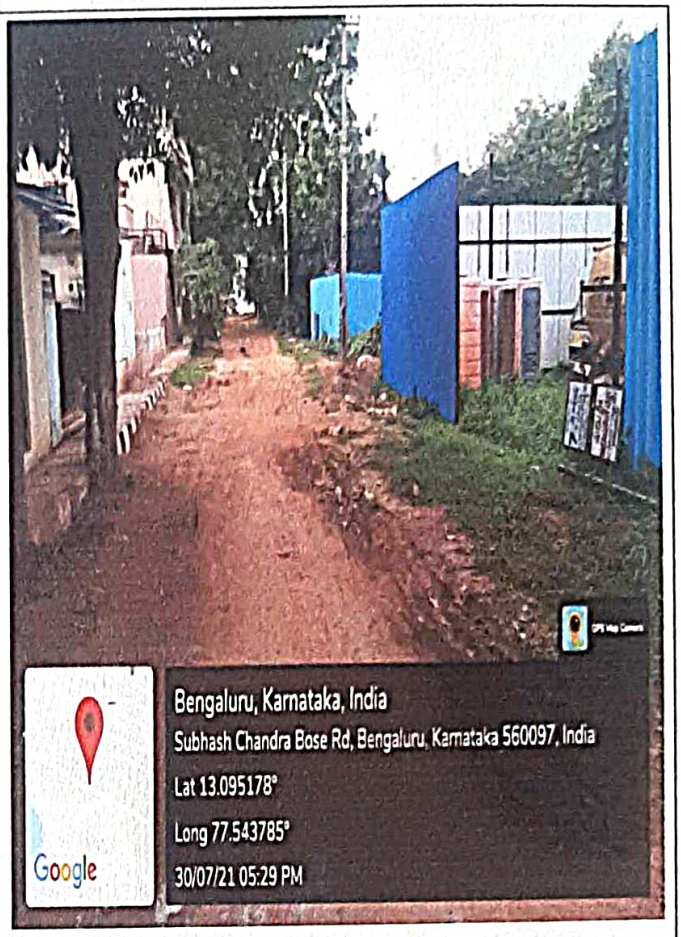
Unit tares are adopted for the items of all project based on the schedule of rates of PWD, Bangalore circle, Bangalore for the year 2018-19. An area weightage mentioned in schedule of rates is also considered above the basic rates. The prevailing markets/issue rates for the item like Bitumen, Cement and Steel etc, are also considered below/ above the schedule of rate

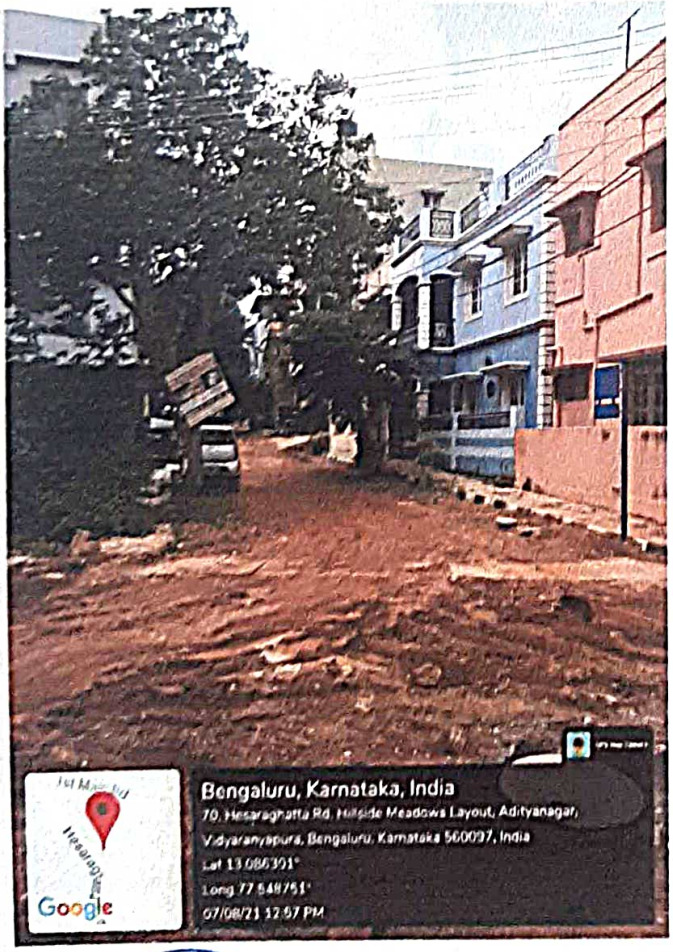
9.1.1. Quantification of items

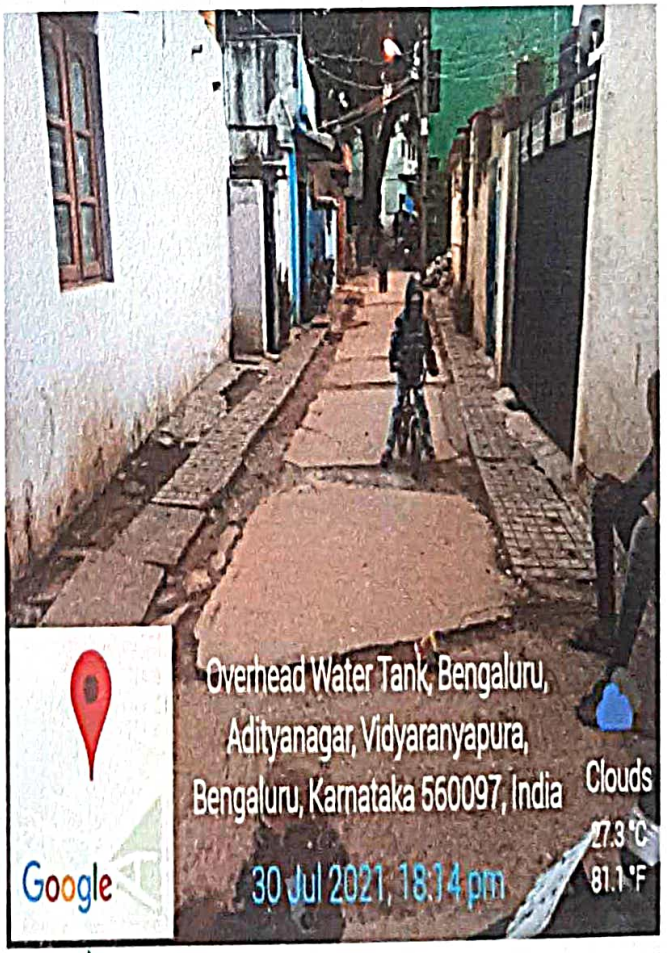
The Quantification of most of the items that are uniformly occurring is calculated per meter based on the typical cross sections. In the respect of culverts and longitudinal drains, provision has been made in the estimate to rectify the damaged portions, The traffic safety measures are also incorporated in the project estimate.

SITE PHOTOS



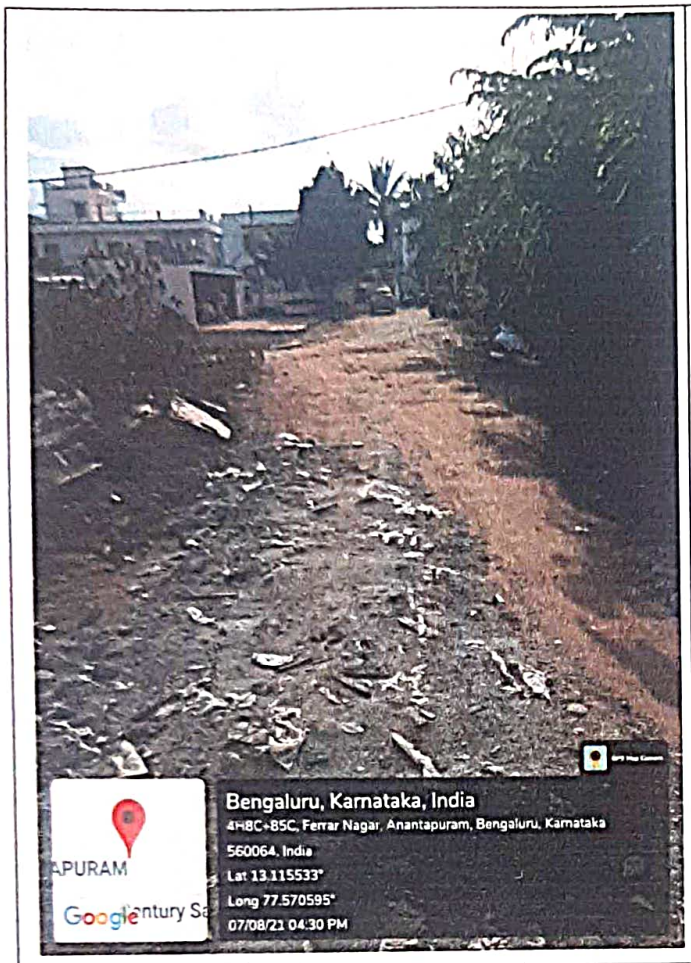


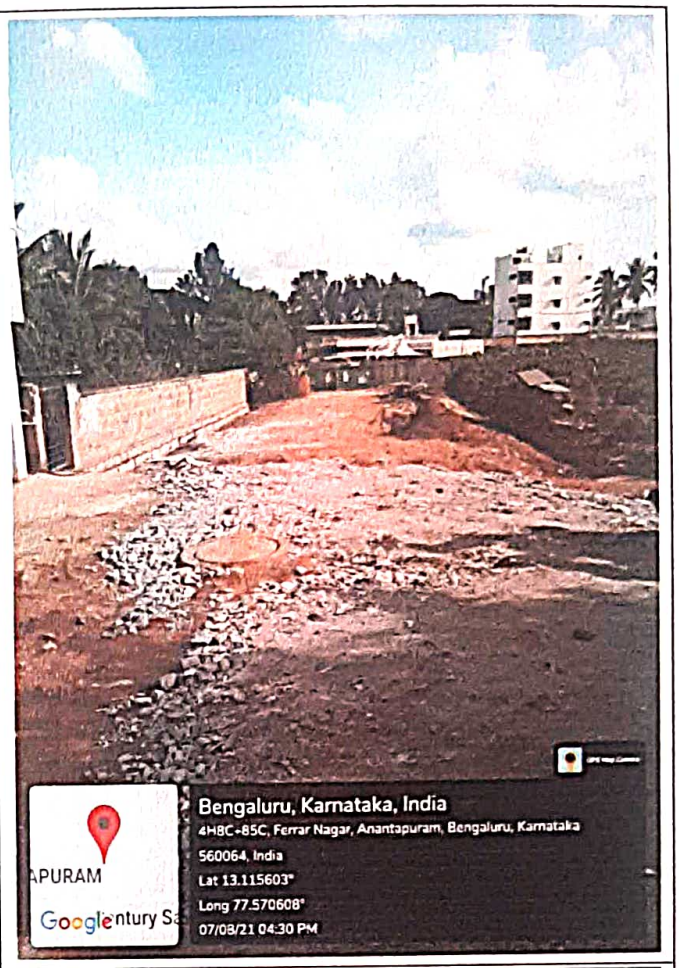


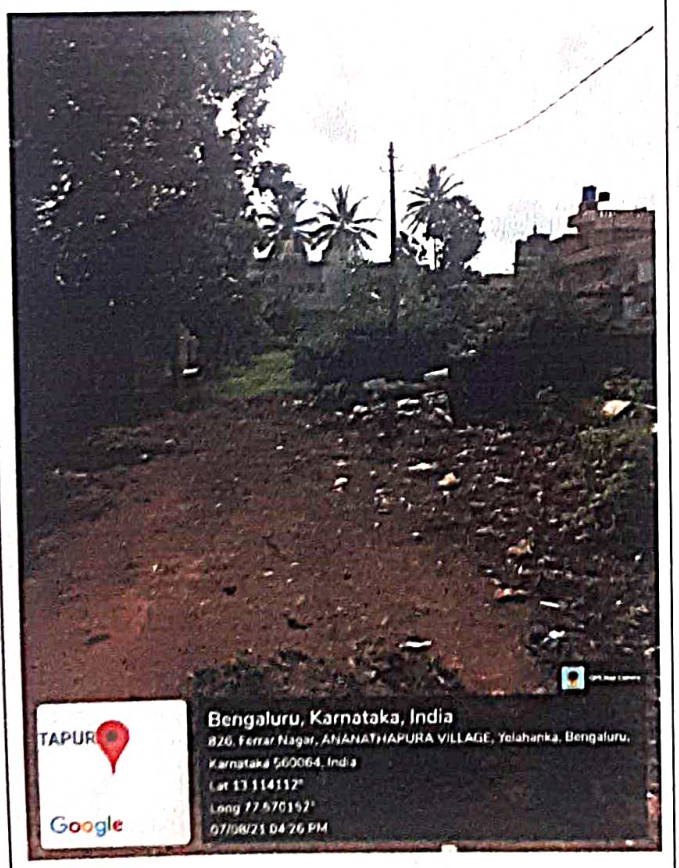


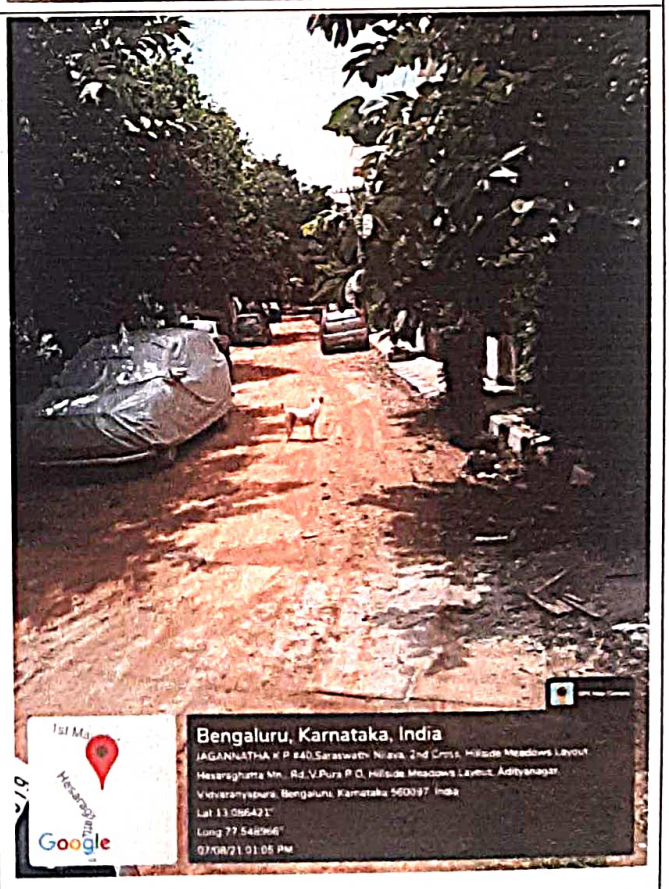
CIVIL PRIME
Bangalore
CONSULTANTS ENGINEERS

ಸಹಾಯಕ ಕಾರ್ಯಪಾಲಕ ಅಭಿಯಂತರರ
ಯಲಹಂಕ ಉಪನಗರ ಉಪವಿಭಾಗ.
ಬಿ.ಡಿ.ಎ.ಪ್ರ. ಬೆಂಗಳೂರು-106



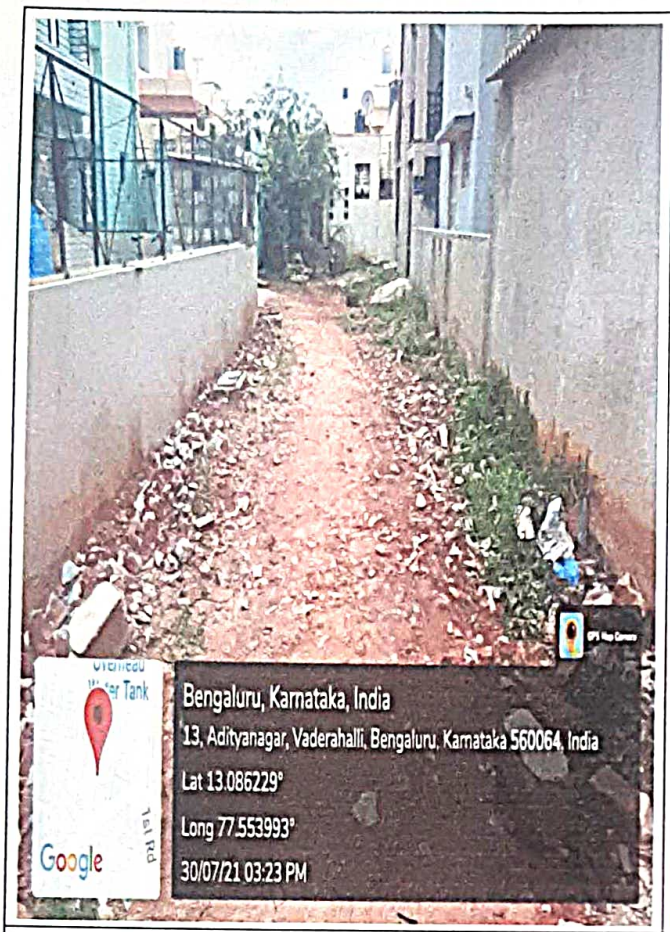


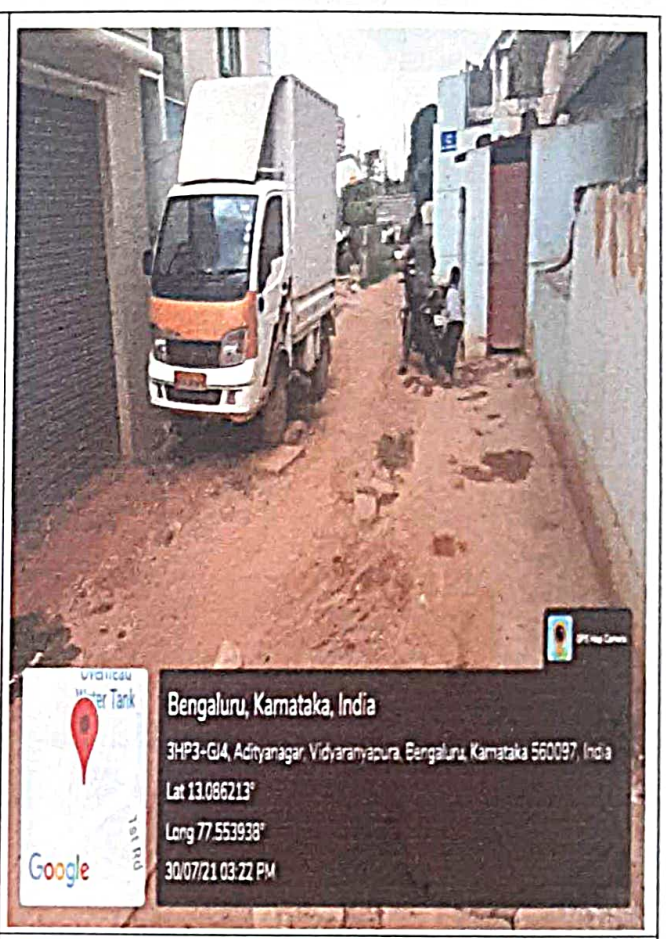


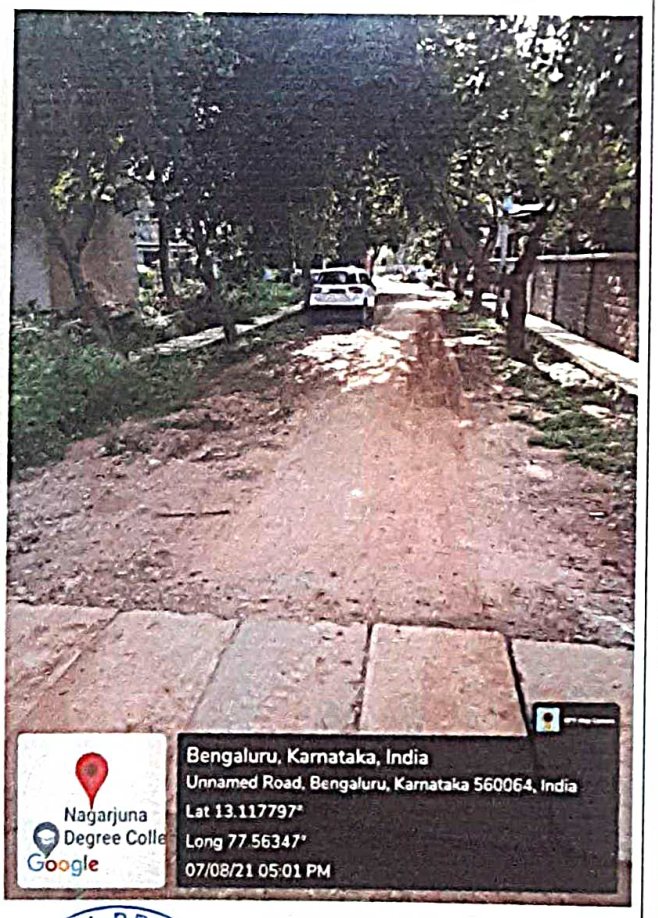

Bengaluru, Karnataka, India
JAGANNATHA K P #40,Saraswathi Nilaya, 2nd Cross, Hillside Meadows Layout
Hesaraghatta Main Rd, V.Pura P O, Hillside Meadows Layout, Adityanagar
Vidyaranyapura, Bengaluru, Karnataka 560097, India
Lat 13.086421°
Long 77.548966°
07/08/21 01:05 PM
Google

CIVIL PRIME CONSULTANTS ENGINEERS Bangalore

ಸಹಾಯಕ ಕಾರ್ಯಪಾಲಕ ಅಭಿಯಂತರರು
ಯಲಹಂಕ ಉಪನಗರ ಉಪವಿಭಾಗ,
ಬಿ.ಬಿ.ಎಂ.ಪಿ. ಬೆಂಗಳೂರು-106

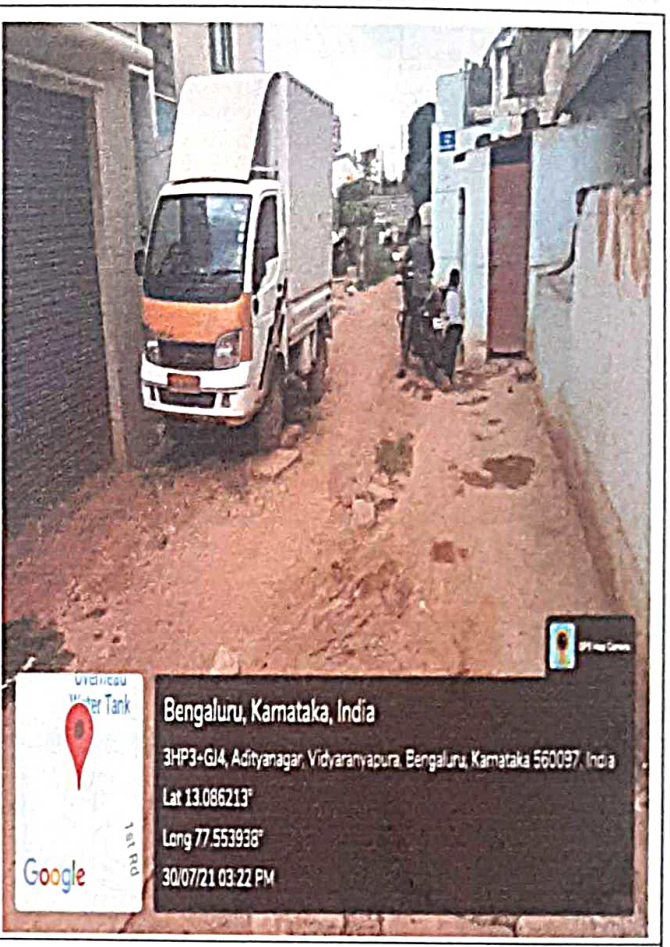


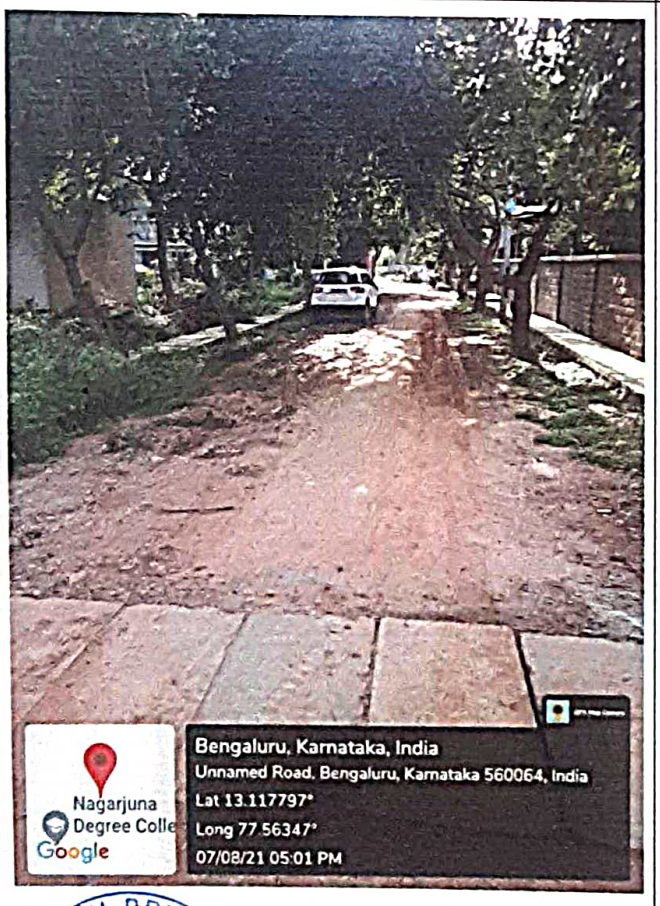




CIVIL PRIME CONSULTANTS AND ENGINEERS Bangalore

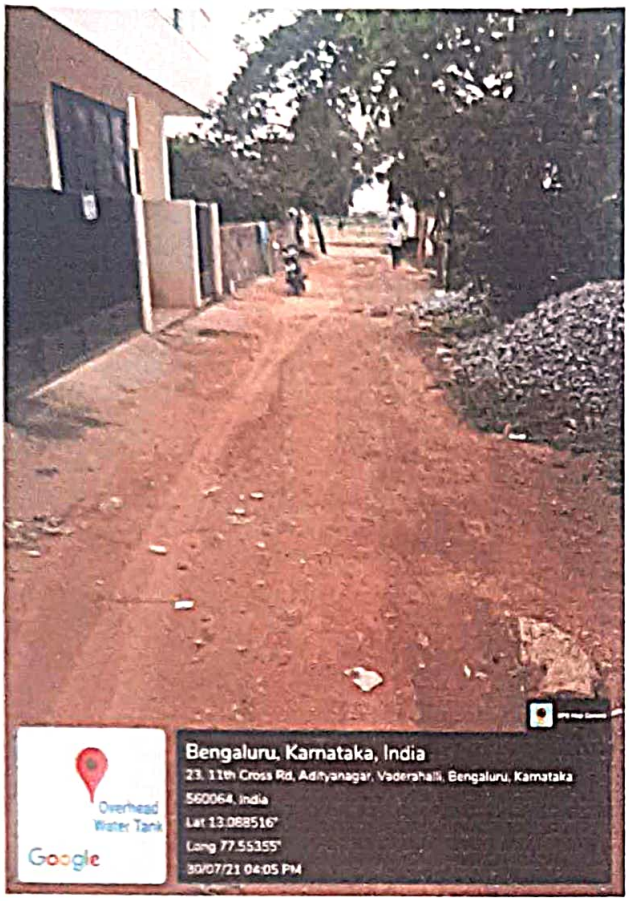
ಸಹಾಯಕ ಕಾರ್ಯಪಾಲಕ ಅಭಿಯಂತರರು
ಯಲಹಂಕ ಉಪನಗರ ಉಪವಿಭಾಗ
ಬಿ.ಬಿ.ಎಂ.ಪಿ. ಬೆಂಗಳೂರು-106

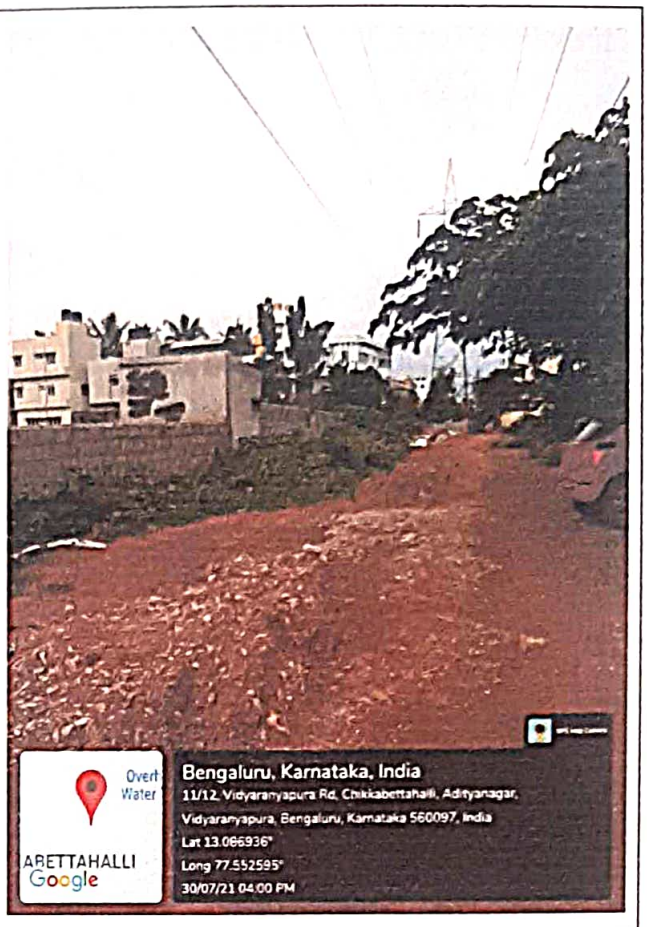


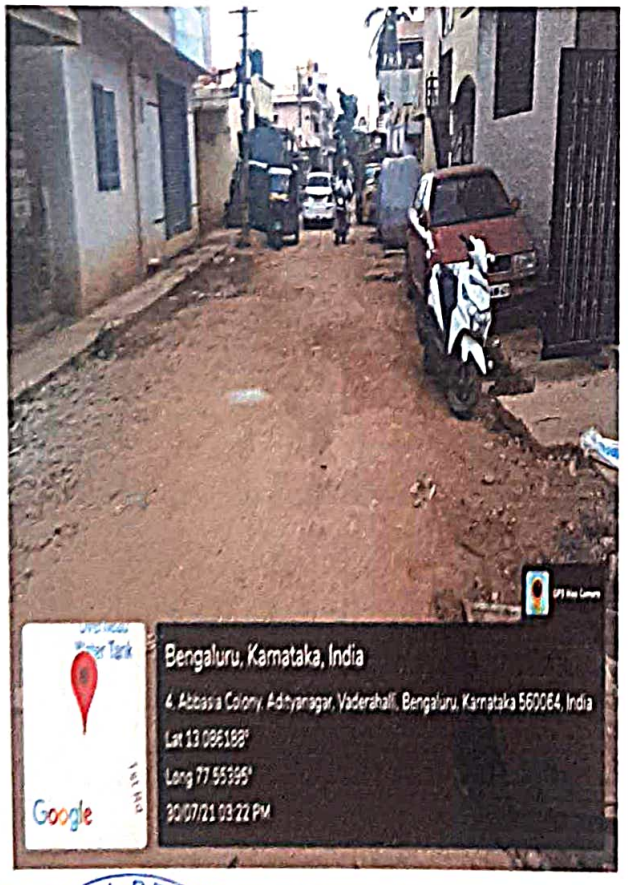


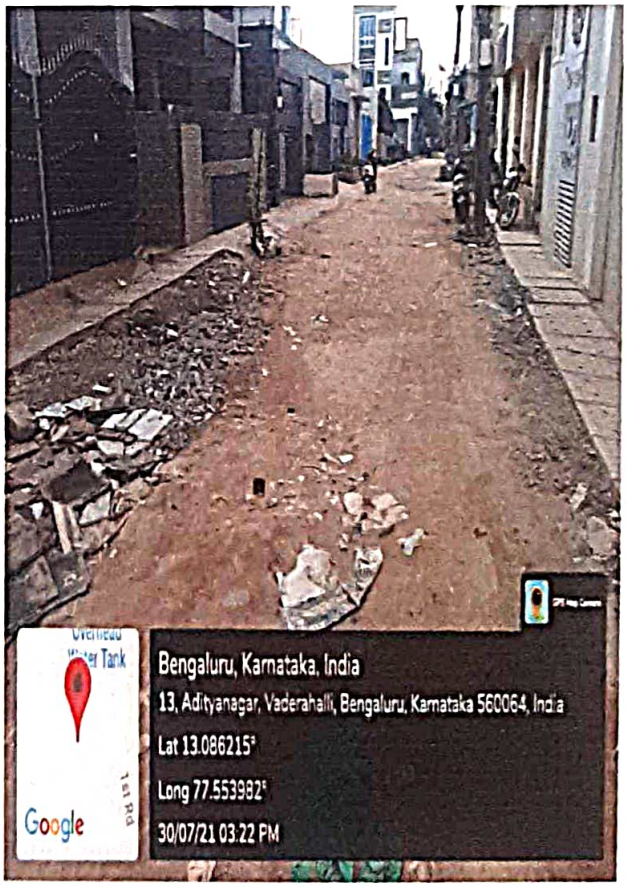
CIVIL PRIME CONSULTANTS AND ENGINEERS Bangalore

ಸಹಾಯಕ ಕಾರ್ಯಪಾಲಕ ಅಭಿಯಂತರರು
ಯಲಹಂಕ ಉಪನಗರ ಉಪವಿಭಾಗ
ಬಿ.ಬಿ.ಎಂ.ಪಿ. ಬೆಂಗಳೂರು-106



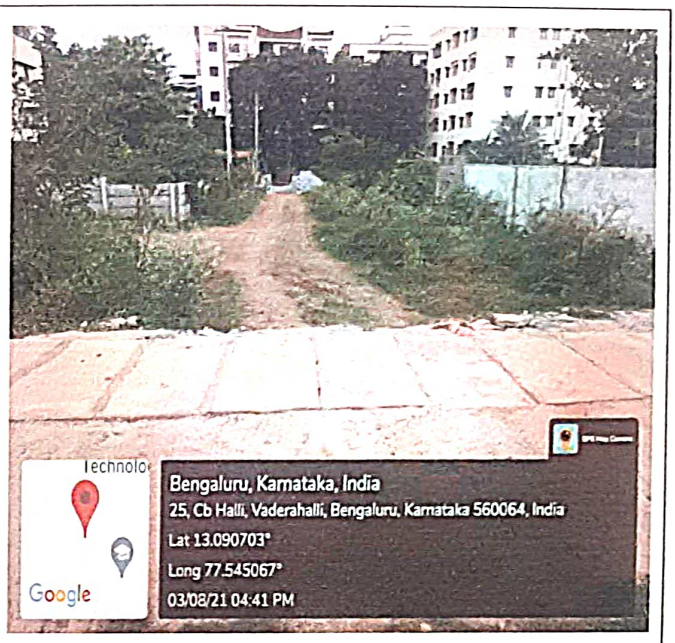


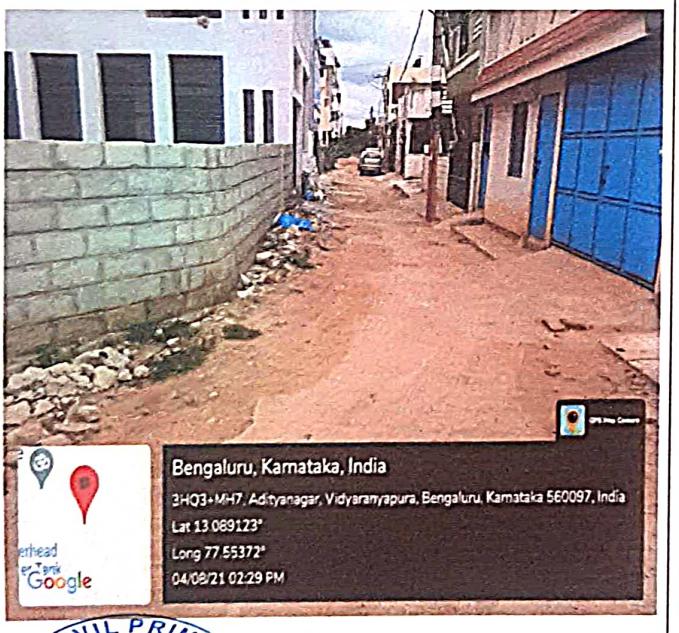




CIVIL PRIME CONSULTANTS AND ENGINEERS Bangalore

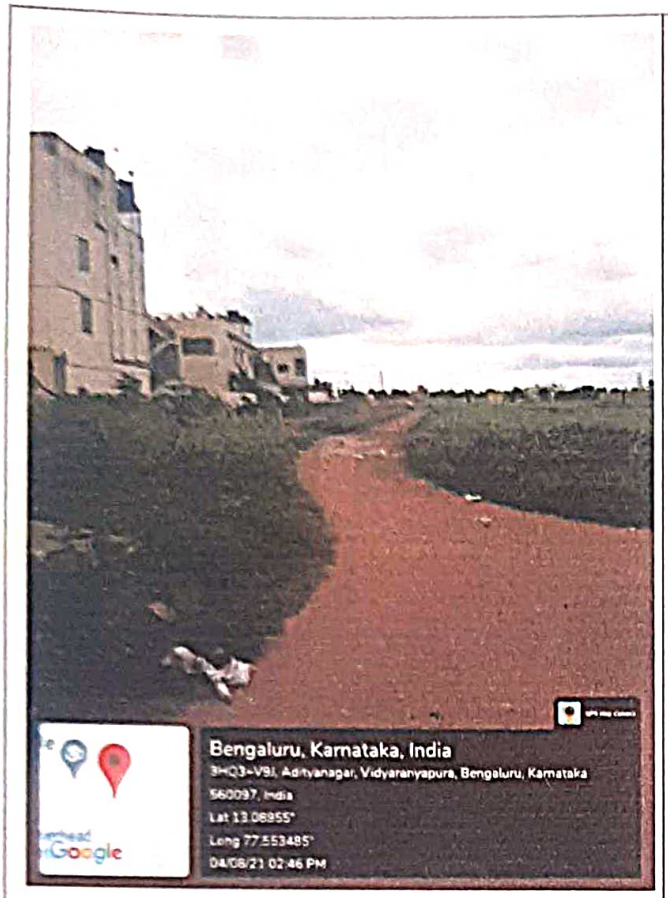
ಸಹಾಯಕ ಕಾರ್ಯಪಾಲಕ ಅಭಿಯಂತರರ
ಯಲಹಂಕ ಉಪನಗರ ಉಪವಿಭಾಗ,
ಬಿ.ಬಿ.ಎಂ.ಪಿ. ಬೆಂಗಳೂರು-106

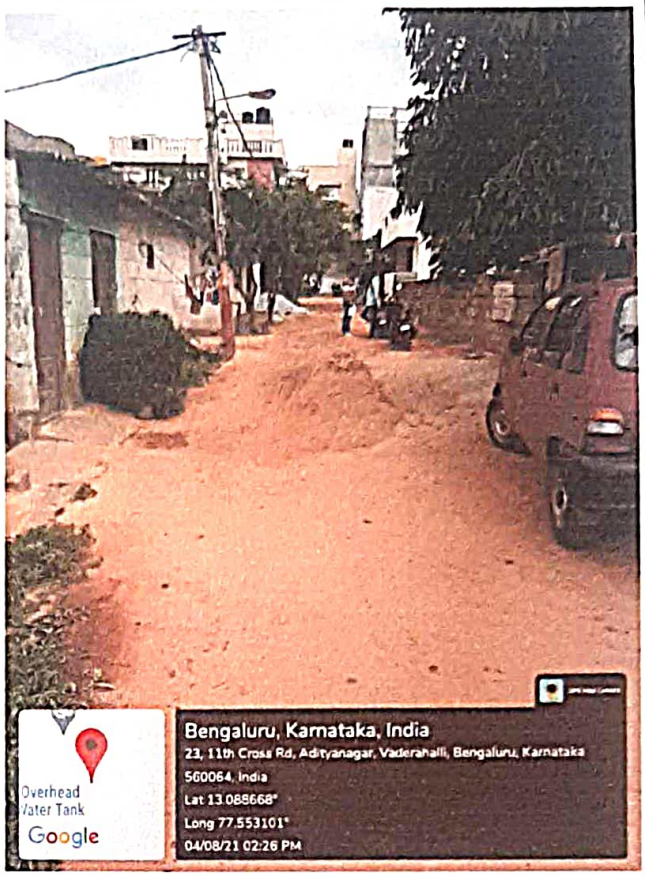


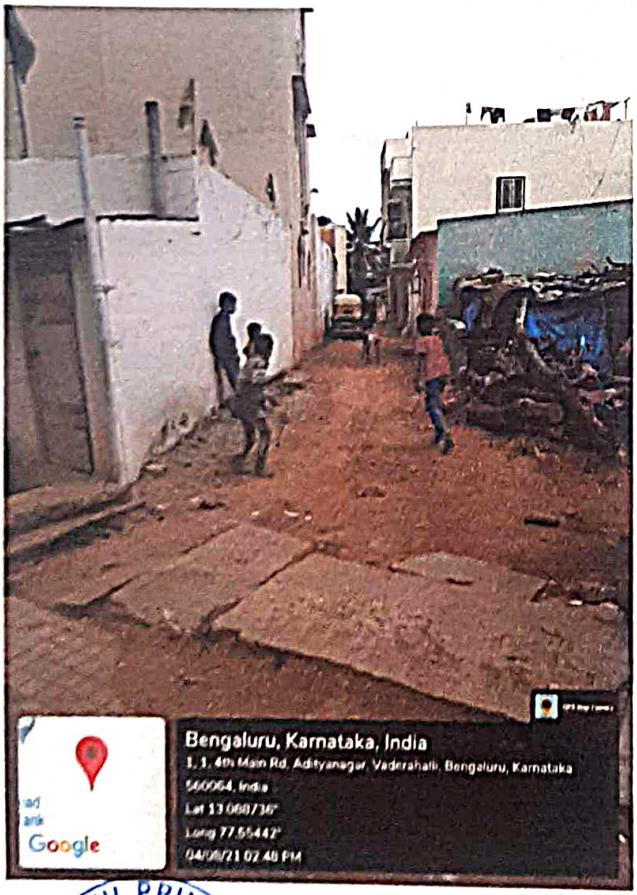


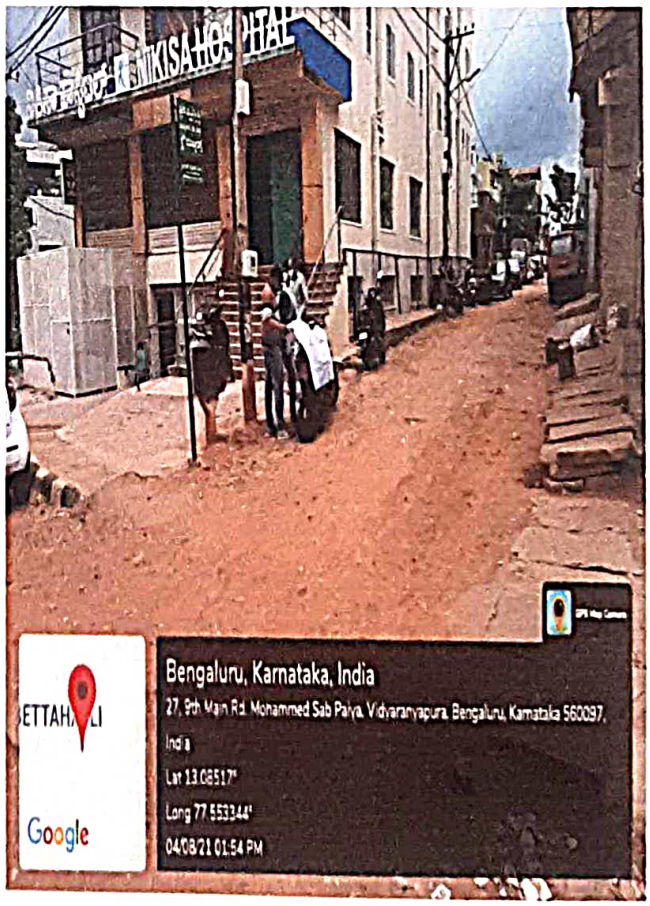
CIVIL PRIME CONSULTANTS AND ENGINEERS Bangalore

ಸಹಾಯಕ ಕಾರ್ಯಪಾಲಕ ಅಭಿಯಂತರರು
ಯಲಹಂಕ ಉಪನಗರ ಉಪವಿಭಾಗ.
ಜಿ.ಬಿ.ಎ.ಎ. ಬೆಂಗಳೂರು-10ರ









CIVIL PRIME CONSULTANTS AND ENGINEERS Bangalore

ಸಹಾಯಕ ಕಾರ್ಯಪಾಲಕ ಅಭಿಯಂತರರು
ಯಲಹಂಕ ಉಪನಗರ ಉಪವಿಭಾಗ.
ಬಿ.ಬಿ.ಎಂ.ಪಿ. ಬೆಂಗಳೂರು-106

NAME OF WORK : Restoration and Improvements of Roads at Hesaraghatta Main road, G Ramaiah layout, Sai Archade layout, Vijaya bank layout, Adityanagara Phase-02, and Surrounding areas in ward no-03 of Yelahanka New Town Sub-division

Estimation Cost Rs.1150.00 Lakhs	PACKAGE No-09

All Dimensions are in Mtr

INDEX	
	R.C.C DRAIN
	C.C Road
	Asphalting
	Desilting

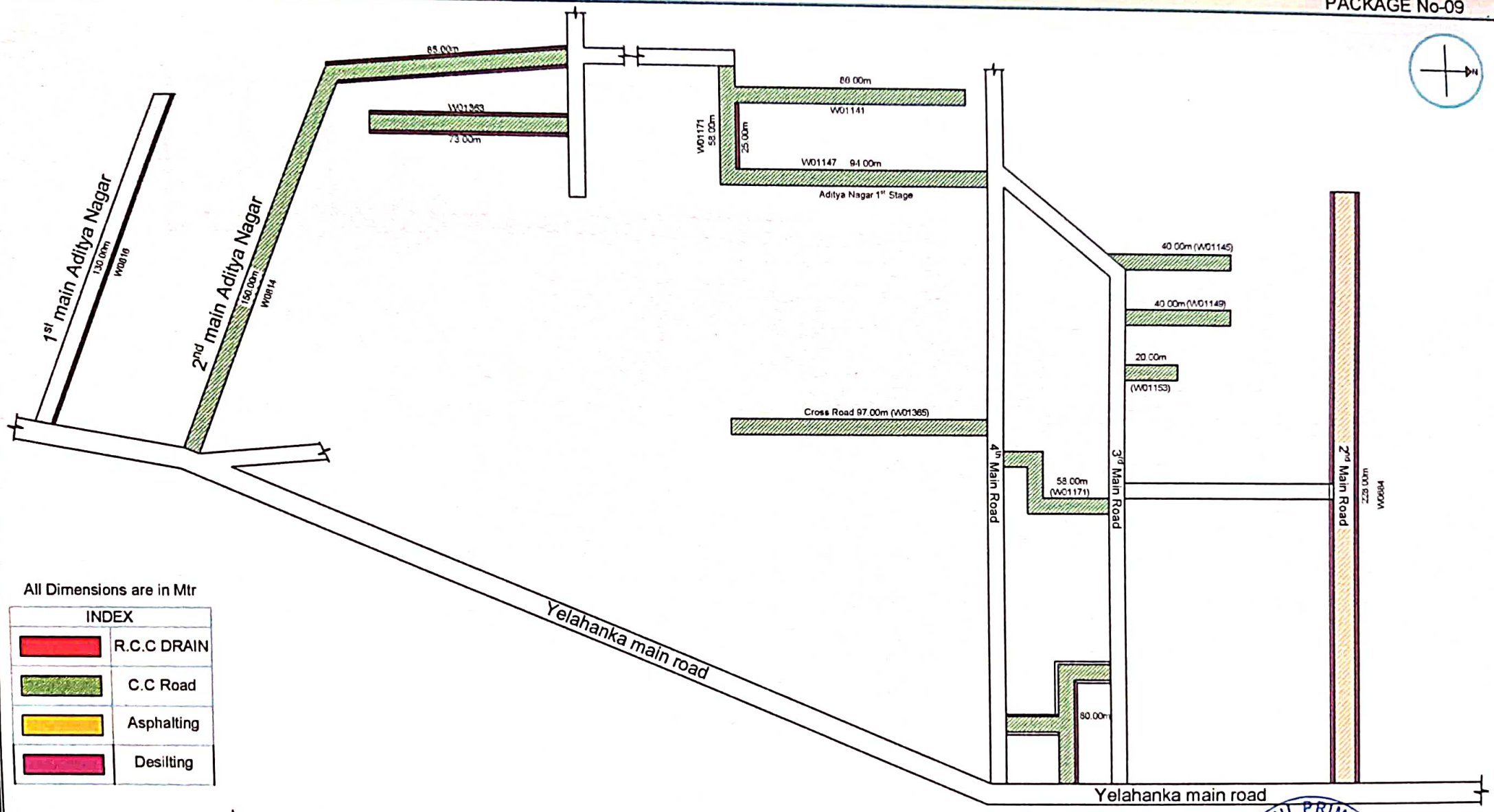
Assistant Engineer
Ward No.03
Attur

Assistant Executive Engineer
Yelahanka Stellite Town Sub-Division
B.B.M.P

For Civil Prime Consultants and Engineers

Estimation Cost Rs.1150.00 Lakhs

PACKAGE No-09



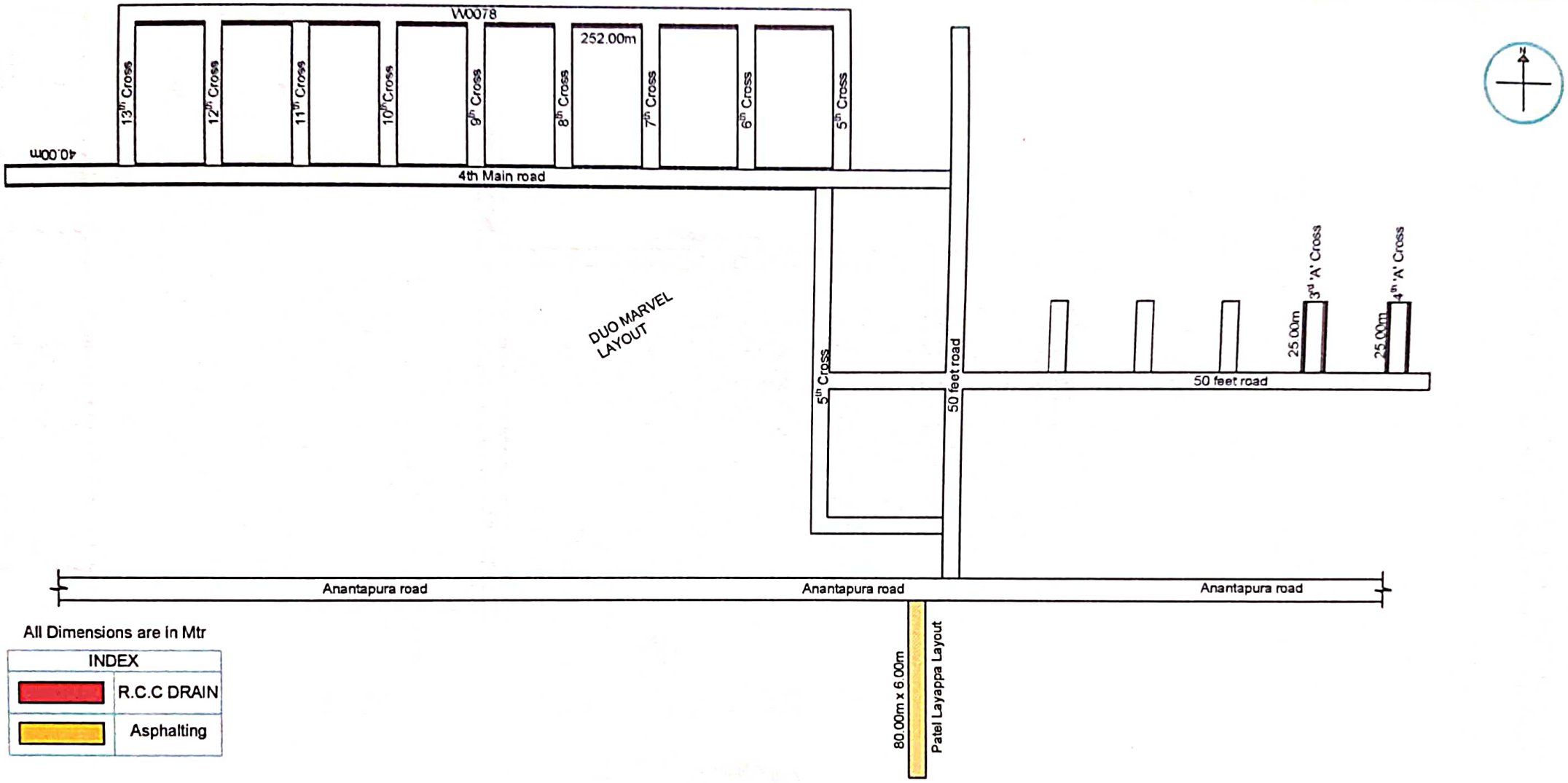
Assistant Engineer
Ward No.03
Attur

Assistant Executive Engineer
Yelahanka Sattle Town Sub-Division
B.B.M.P

For Civil Prime Consultants and Engineers

Estimation Cost Rs.1150.00 Lakhs

PACKAGE No-09



All Dimensions are in Mtr

INDEX	
	R.C.C DRAIN
	Asphalting

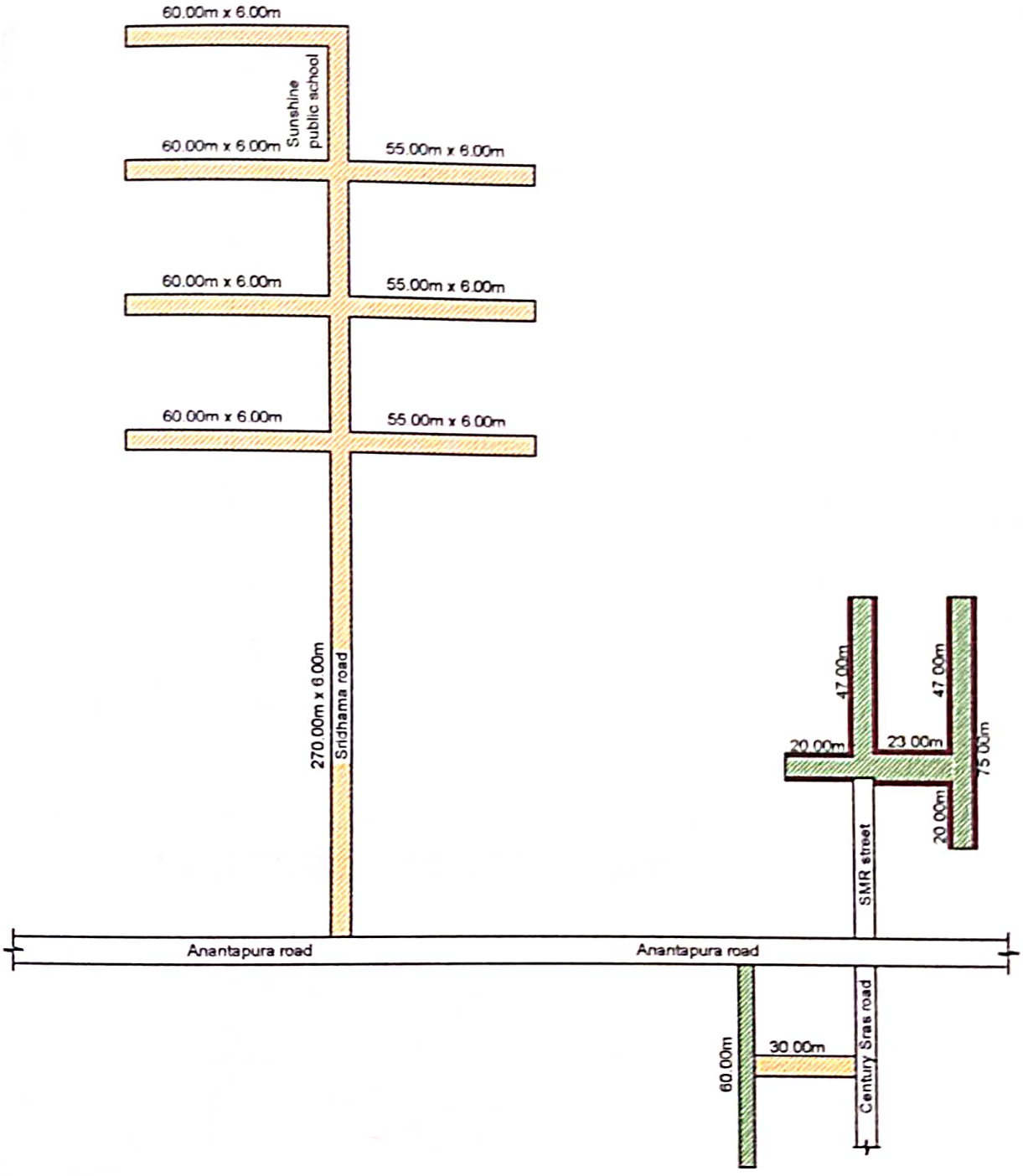
Assistant Engineer
Ward No.03
Attur

Assistant Executive Engineer
Yelahanka Stellite Pothole Division
B.B.M.P

For Civil Prime Consultants and Engineers

NAME OF WORK : Restoration and Improvements of Roads at Hesaraghatta Main road, G Ramaiah layout, Sai Archade layout, Vijaya bank layout, Adityanagara Phase-02, and Surrounding areas in ward no-03 of Yelahanka New town Sub-division

Estimation Cost Rs.1150.00 Lakhs	PACKAGE No-09



All Dimensions are in Mtr

INDEX	
	R.C.C DRAIN
	C.C Road
	Asphalting

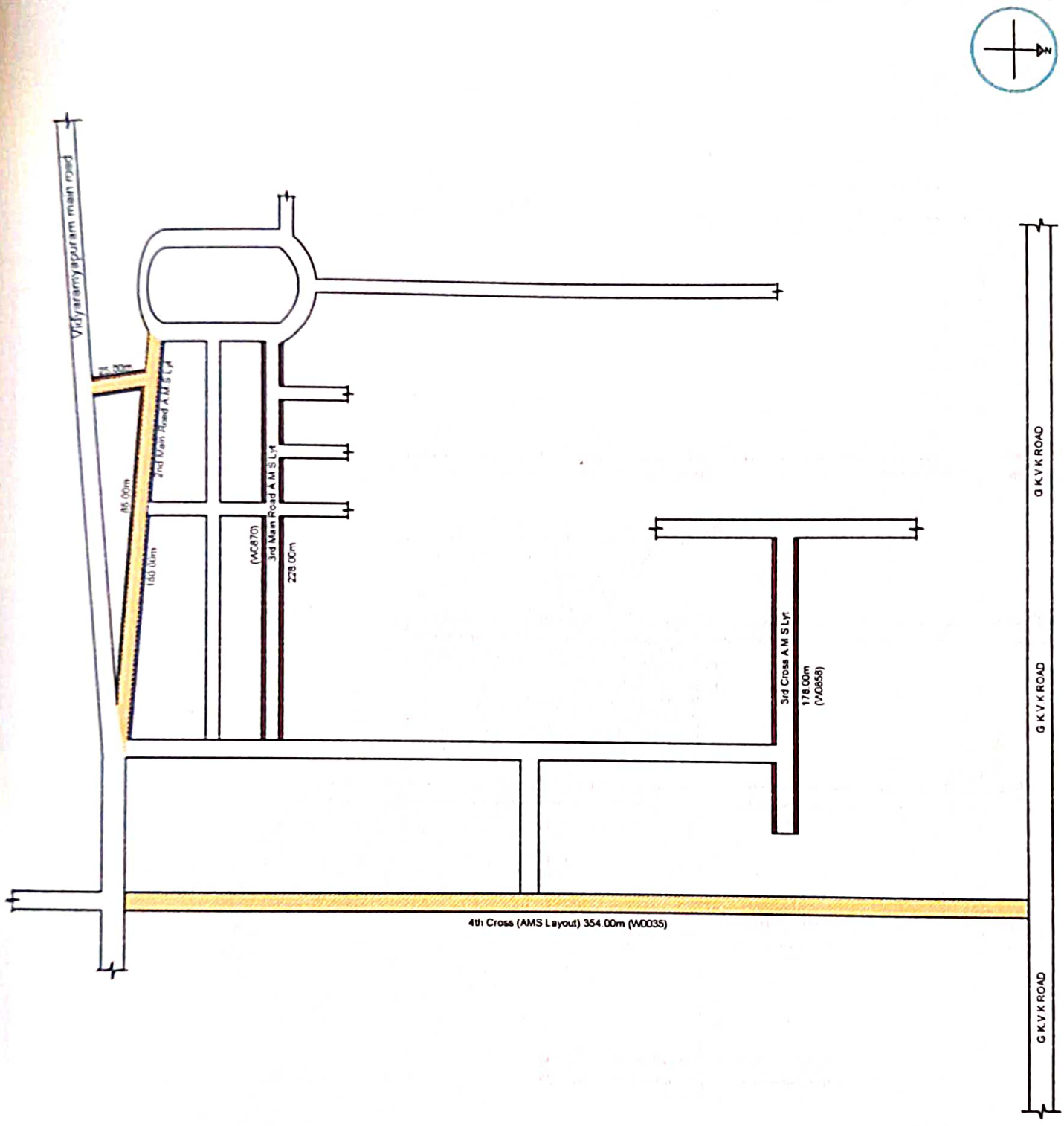
Assistant Engineer
Ward No-03

Assistant Executive Engineer
Satellite Town Sub Division

CIVIL PRIME CONSULTANTS Bangalore

NAME OF WORK : Restoration and Improvements of Roads at Hesaraghatta Main road, G Ramaiah layout, Sai Archade layout, Vijaya bank layout, Adityanagara Phase-02, and Surrounding areas in ward no-03 of Yelahanka New town Sub-division

Estimation Cost Rs.1150.00 Lakhs	PACKAGE No-09



All Dimensions are in Mtr

INDEX	
	R.C.C DRAIN
	Asphalting

Assistant Engineer
Ward No.03

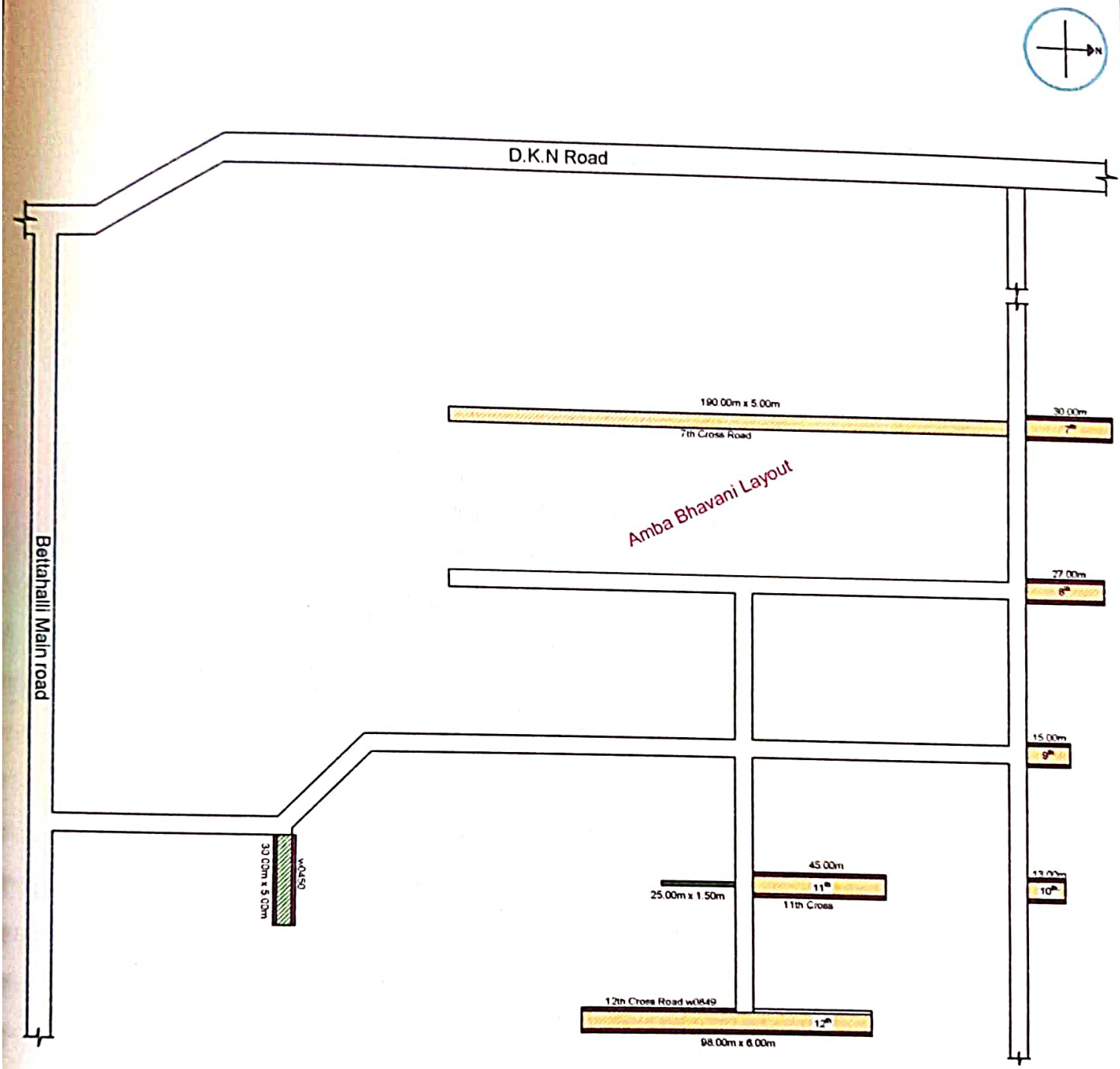
Assistant Executive Engineer
Yelahanka Satellite

CIVIL PRIME CONSULTANTS ENGINEERS Bangalore

NAME OF WORK : Restoration and Improvements of Roads at Hesaraghatta Main road, G Ramaiah layout, Sai Archade layout, Vijaya bank layout, Adityanagara Phase-02, and Surrounding areas in ward no-03 of Yelahanka New town Sub-division

Estimation Cost Rs.1150.00 Lakhs

PACKAGE No-09



All Dimensions are in Mtr

INDEX	
	R.C.C DRAIN
	Asphalting
	CC Road

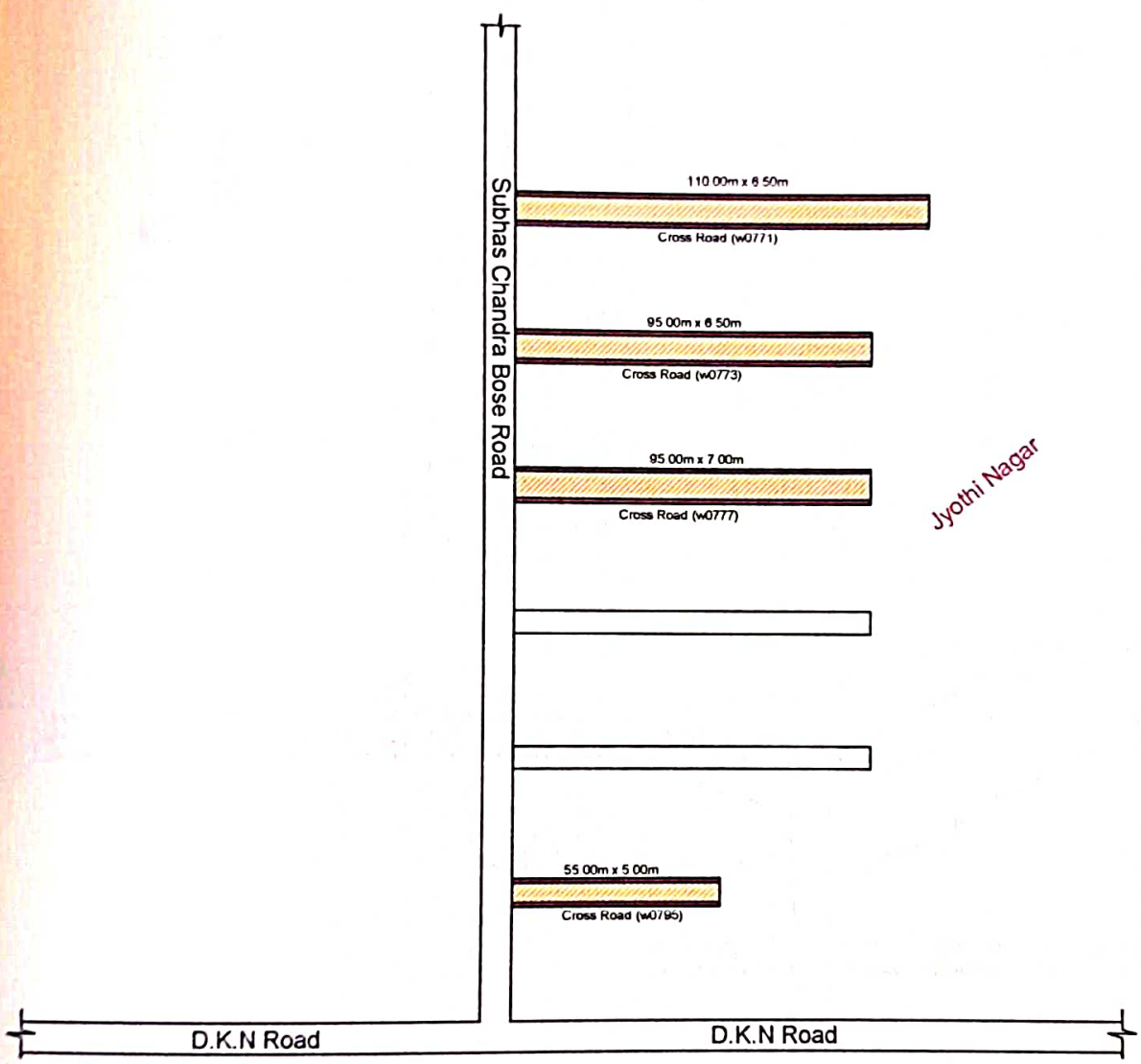
Assistant Engineer
Ward No.03
Attur

Assistant Executive Engineer
Yelahanka Stellite Town Sub-Division
B.B.M.P

For Civil Prime Consultants and Engineers

NAME OF WORK : Restoration and Improvements of Roads at Hesaraghatta Main road, G Ramaiah layout, Sai Archade layout, Vijaya bank layout, Adityanagara Phase-02, and Surrounding areas in ward no-03 of Yelahanka New town Sub-division

Estimation Cost Rs.1150.00 Lakhs	PACKAGE No-09



All Dimensions are in Mtr

INDEX	
	R.C.C DRAIN
	Asphalting

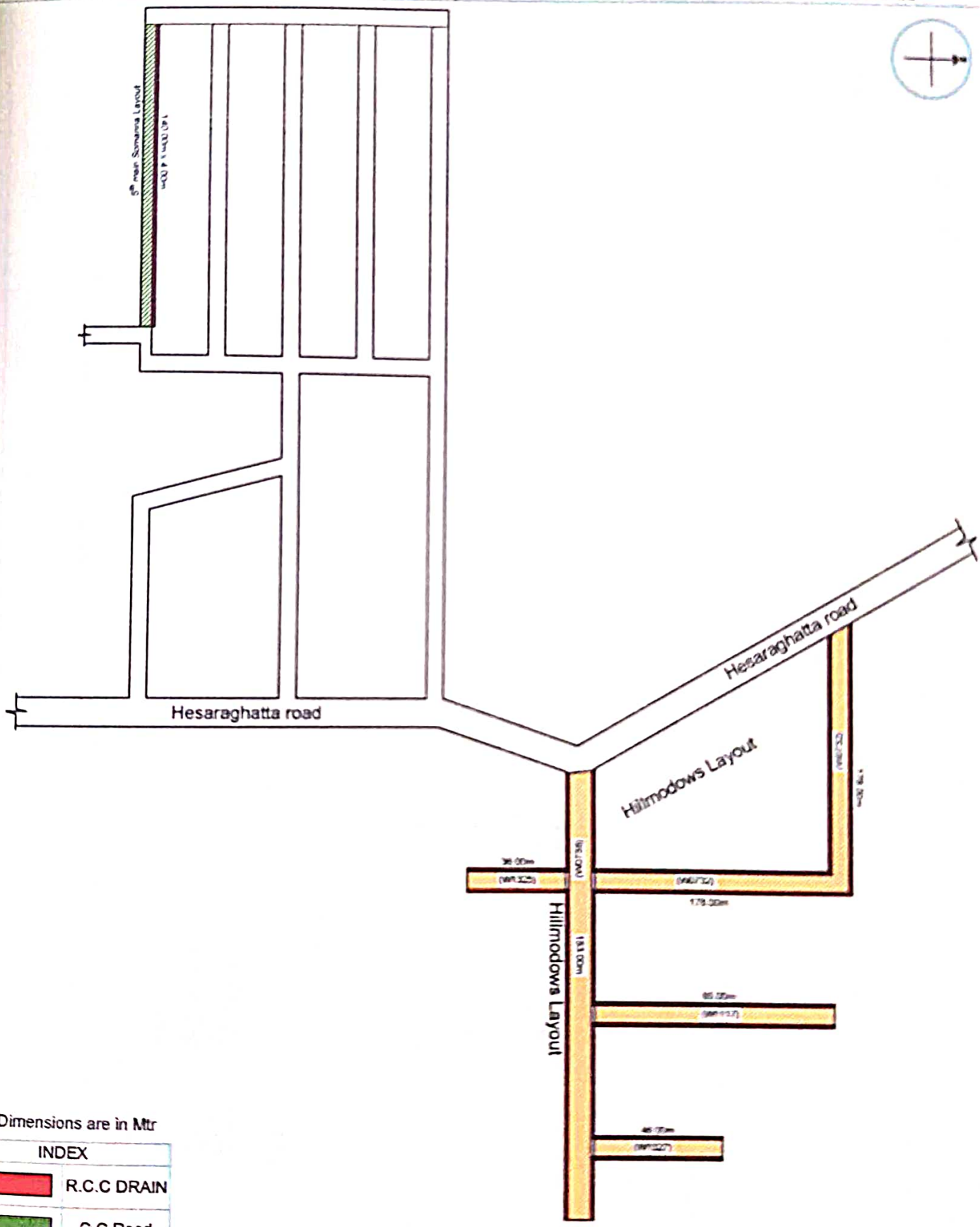
Assistant Engineer
Ward No.03
Attur

Assistant Executive Engineer
Yelahanka Stellite Town Sub-Division
B.B.M.P

For Civil Prime Consultants and Engineers

NAME OF WORK : Restoration and Improvements of Roads at Hesaraghatta Main road, G Ramaiah layout, Sai Archade layout, Vijaya bank layout, Adityanagara Phase-02, and Surrounding areas in ward no-03 of Yelahanka New town Sub-division

Estimation Cost Rs.1150.00 Lakhs	PACKAGE No-09



All Dimensions are in Mtr

INDEX	
	R.C.C DRAIN
	C.C Road
	Asphalting

Assistant Engineer

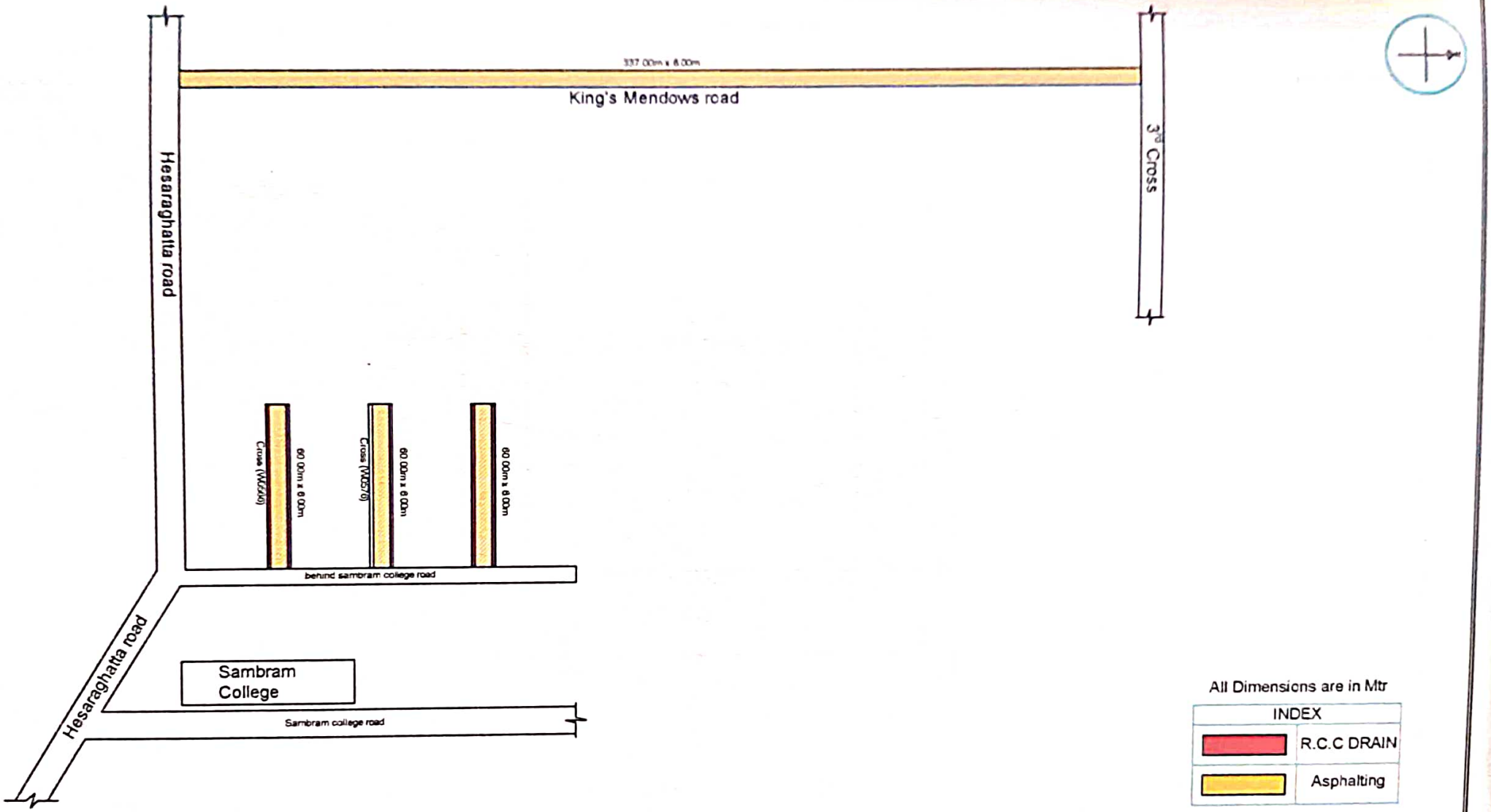
Assistant Executive Engineer

CIVIL PRIME CONSULTANTS Bangalore

NAME OF WORK : Restoration and Improvements of Roads at Hesaraghatta Main road, G Ramaiah layout, Sai Archada layout, Vijaya bank layout, Adityanagara Phase-02, and Surrounding areas in ward no-03 of Yelahanka New town Sub-division

Estimation Cost Rs.1150.00 Lakhs

PACKAGE No-09



All Dimensions are in Mtr

INDEX	
	R.C.C DRAIN
	Asphalting

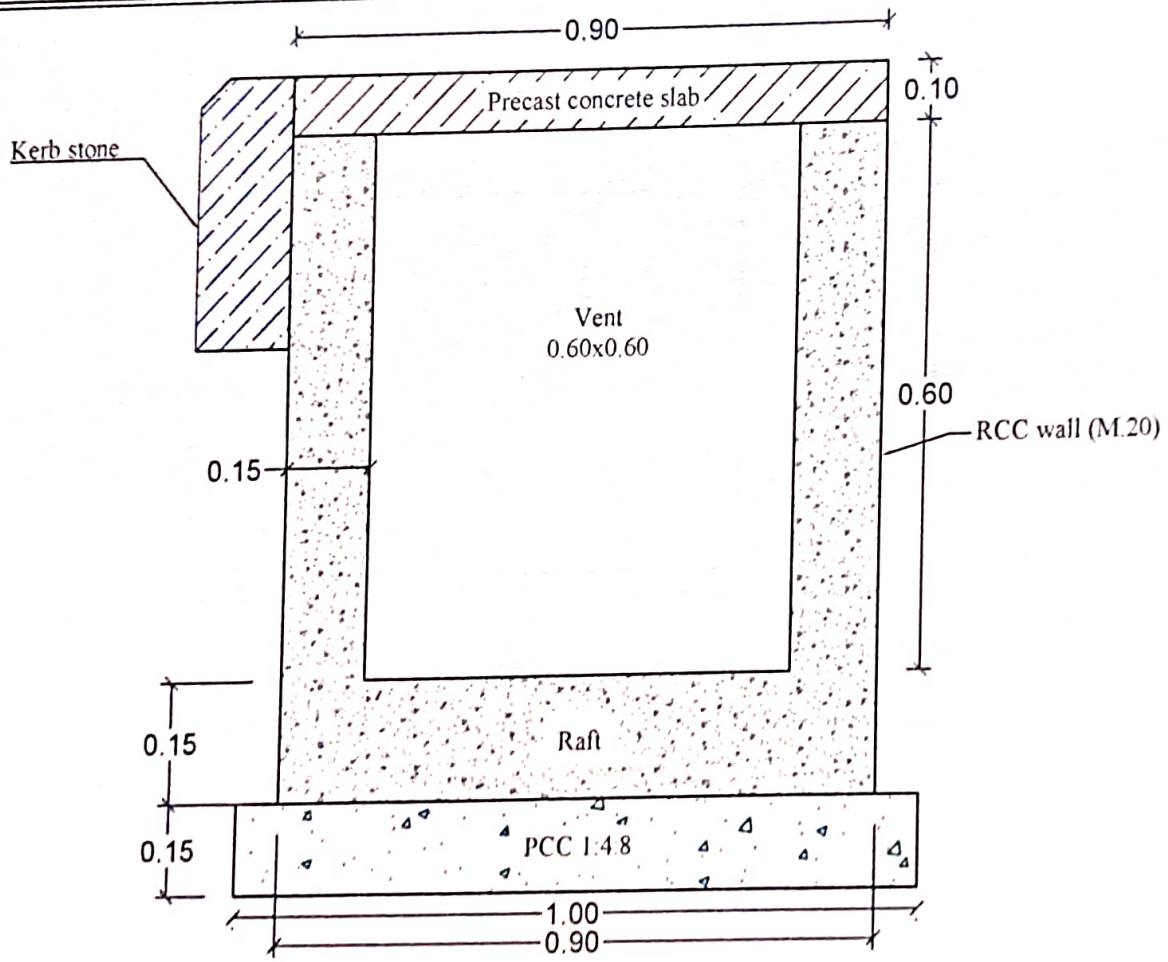
Assistant Engineer
Ward No.03
Attur

Assistant Executive Engineer
Yelahanka New Town Sub-Division
Bangalore-106

For Civil Prime Consultants and Engineers

NAME OF WORK : Restoration and Improvements of Roads at Hesaraghatta Main road, G Ramaiah layout, Sai Archade layout, Vijaya bank layout, Adityanagara Phase-02, and Surrounding areas in ward no-03 of Yelahanka New town Sub-division

PACKAGE NO -09	Estimated cost:-11.50Cr



Cross section of RCC Drain

Note:-Drawing not to scale
All Dimensions in meters

CLIENT:-BRUHAT BENGALURU MAHANAGARA PALIKE

Assistant Engineer
Ward No.03
Attur

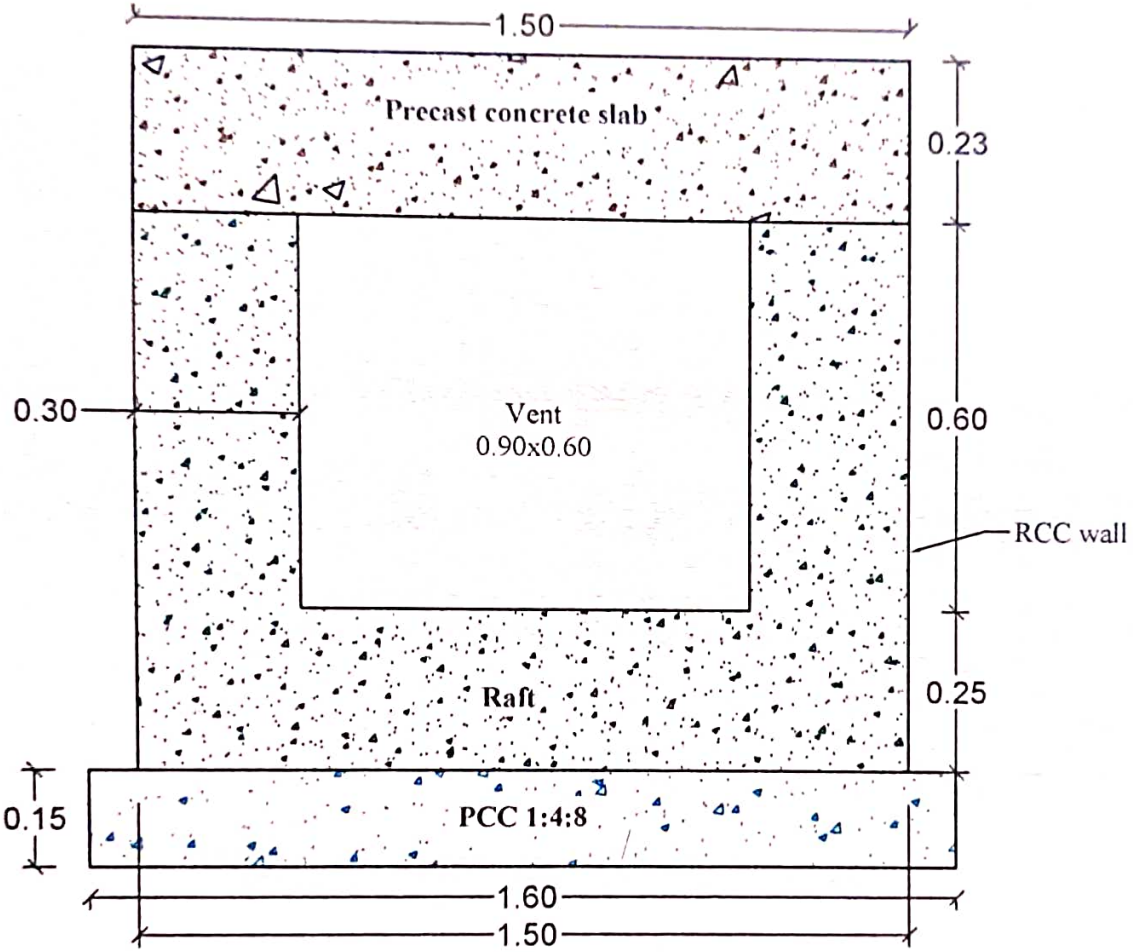
Assistant Executive Engineer
Yelahanka Satellite Town Sub-Division
BBMP

CONSULTANT:-

CIVIL PRIME CONSULTANTS AND ENGINEERS
No.23, Shivakrupa CKM road, Near Akal Public School, RMV 2nd Stage,
Sanjay Nagar, Bengaluru-560094

PACKAGE NO -09

Estimated cost:-11.50Cr



Cross section of RCC Culverts

Note:-Drawing not to scale
All Dimensions in meters

CLIENT:-BRUHAT BENGALURU MAHANAGARA PALIKE

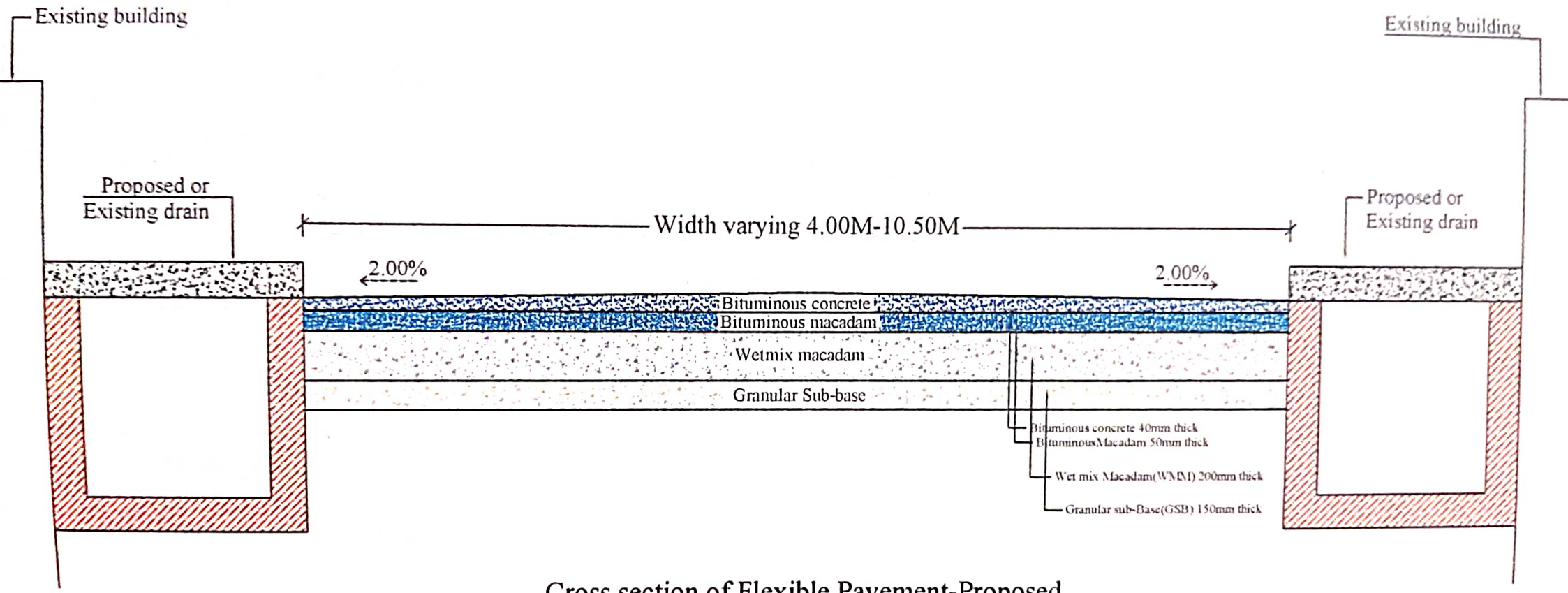
Assistant Engineer
Ward No.03
Attur

Assistant Executive Engineer
Yelahanka Satellite Town Sub-Division
BBMP

CONSULTANT:-

CIVIL PRIME CONSULTANTS AND ENGINEERS
No.23, Shivakrupa CKM road, Near Akal Public School, RMV 2nd Stage,
Sanjay Nagar, Bengaluru-560094

PACKAGE NO -09	Estimated cost:-11.50Cr



Cross section of Flexible Pavement-Proposed

Note:-Drawing not to scale
All Dimensions in meters

CLIENT:-BRUHAT BENGALURU MAHANAGARA PALIKE

Assistant Engineer
Ward No.03
Attur

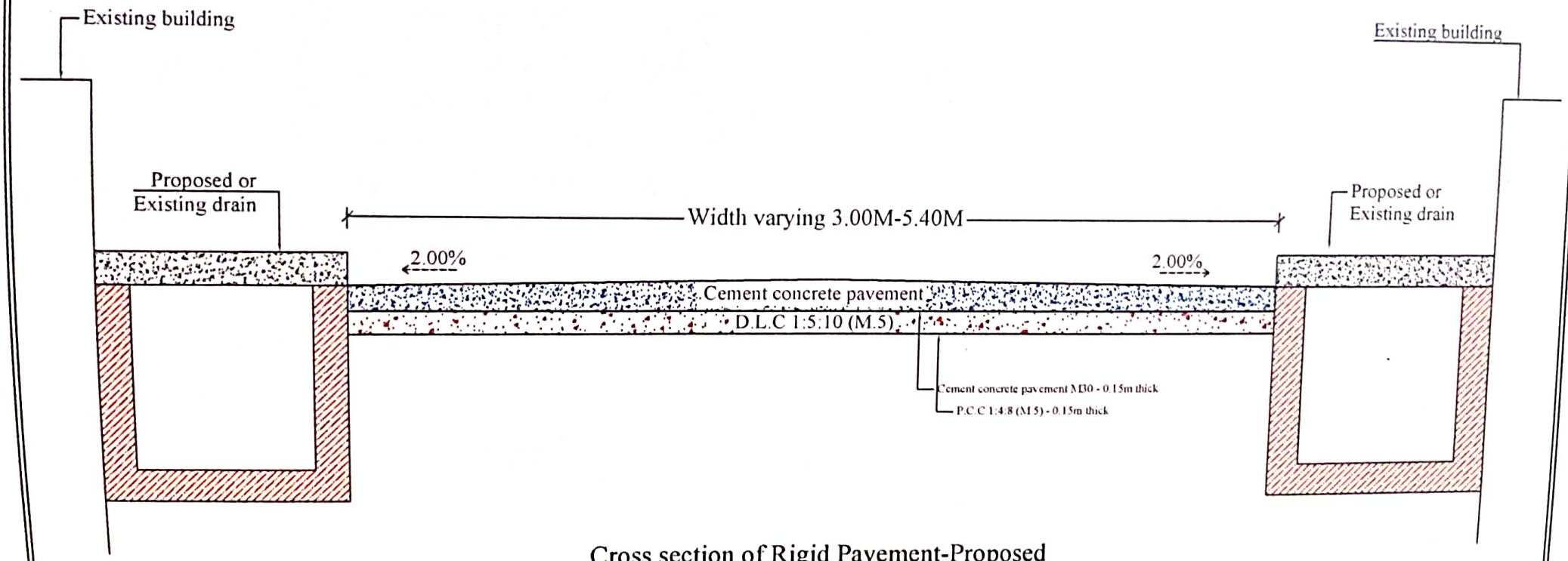
Assistant Executive Engineer
Yelahanka Satellite Town Sub-Division
BBMP

CONSULTANT:-

CIVIL PRIME CONSULTANTS AND ENGINEERS
No.23, Shivakrupa CKM road, Near Akki Public School, RMV 2nd Stage,
Sanjay Nagar, Bengaluru-560094

NAME OF WORK : Restoration and Improvements of Roads at Hesaraghatta Main road, G Ramaiah layout, Sai Archade layout, Vijaya bank layout, Adityanagara Phase-02, and Surrounding areas in ward no-03 of Yelahanka New town Sub-division

PACKAGE NO -09	Estimated cost:-11.50Cr



Cross section of Rigid Pavement-Proposed

Note:-Drawing not to scale
All Dimensions in meters

CLIENT:-BRUHAT BENGALURU MAHANAGARA PALIKE

Assistant Engineer
Ward No.03
Attur

Assistant Executive Engineer
Yelahanka Satellite Town Sub-Division
BBMP

CONSULTANT:-

CIVIL PRIME CONSULTANTS AND ENGINEERS
No.23, Shivakrupa CKM road, Near Akal Public School, RMV 2nd Stage,
Sanjay Nagar, Bengaluru-560094